



# Service Data

SD-13-47672A

## Bendix® TABS-6™ Advanced Multi-Channel (MC) Trailer ABS Module - Generation 2

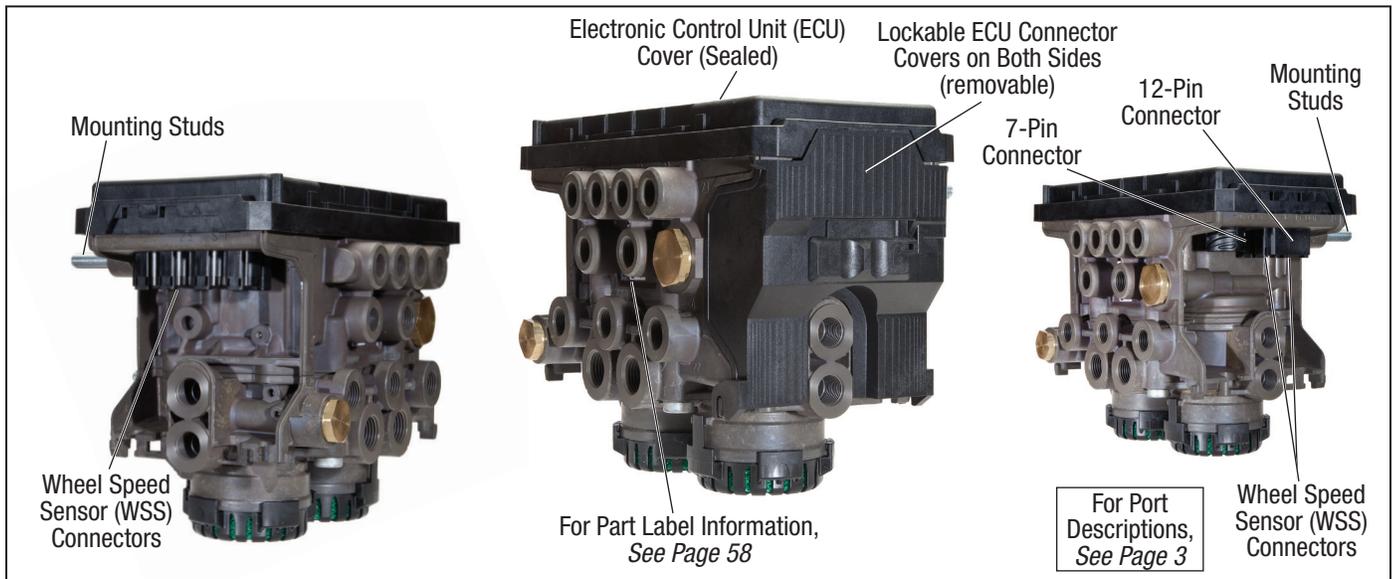


Figure 1 – Bendix® TABS-6™ Advanced Multi-Channel (MC) Antilock Braking System (ABS) Module

### 1. INTRODUCTION

The Bendix® TABS-6™ Advanced Multi-Channel (MC) module (Generation 2) is an integrated, MC (4S/2M) trailer service brake module controller for air-braked, heavy-duty semi trailers that features the Bendix® Antilock Brake System (ABS) and Bendix® Trailer Roll Stability Program (TRSP®).

Installed on semi-trailers, the module acts as a relay valve during normal braking, but during ABS events, it will intervene to help maintain vehicle stability and minimize stopping distance by preventing wheel lock-up. The Bendix TRSP monitors the trailer's motion and reduces the risk of rollovers by automatically applying the brakes when a risk of a rollover is detected.

This module features:

- A modular design with an integrated Electronic Control Unit (ECU); pressure sensors; a lateral acceleration sensor; and Modulator Relay Valves (MRVs) – eliminating external pigtail harnesses for these components
- An operating voltage range of 8 - 32 volts
- An electronic odometer with trip counters and service interval options
- A scratch-pad feature with up to 1,008 bytes of freely definable read/write text space available for customer use
- An extended data logging feature, including a resettable drive recorder

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- A wide variety of electrical inputs/outputs (I/Os) that allow the customer to program auxiliary functions such as automatic Lift Axle Control (LAC); Integrated Speed Switch (ISS); external load sensors; Auxiliary Design Language (ADL) for customized auxiliary functions; and others
- A wide range of diagnostic tools for flexible troubleshooting such as blink codes; SAE J2497 Power Line Carrier (PLC); SAE J1939 (CAN) diagnostics; the Bendix® Trailer Remote Diagnostic Unit (TRDU); and the Bendix® Trailer Information Module
- Support for SAE J2497 PLC communication to the towing vehicle and diagnostics
- Support for SAE J1939 (CAN) communication for diagnostics and external devices
- A pressure-equalizing valve in the sealed Electronic Control Unit (ECU) housing to give improved protection from water, etc.
- A serviceable nylon filter to help prevent foreign material from entering the control port
- Locking dust covers to provide electrical connector and cable protection

## 2. GENERAL SAFETY GUIDELINES



**WARNING! PLEASE READ AND FOLLOW THESE INSTRUCTIONS!**



**TO AVOID PERSONAL INJURY OR DEATH:**

**When working on or around a vehicle, the following guidelines should be observed AT ALL TIMES:**

- ▲ Park the vehicle on a level surface, apply the parking brakes and always block the wheels. Always wear personal protection equipment.
- ▲ Stop the engine and remove the ignition key when working under or around the vehicle. When working in the engine compartment, the engine should be shut off and the ignition key should be removed. Where circumstances require that the engine be in operation, EXTREME CAUTION should be used to prevent personal injury resulting from contact with moving, rotating, leaking, heated or electrically-charged components.
- ▲ Do not attempt to install, remove, disassemble or assemble a component until you have read, and thoroughly understand, the recommended procedures. Use only the proper tools and observe all precautions pertaining to use of those tools.
- ▲ If the work is being performed on the vehicle's air brake system, or any auxiliary pressurized air systems, make certain to drain the air pressure from all reservoirs before beginning ANY work on the vehicle. If the vehicle is equipped with a Bendix® AD-IS® air dryer system, a Bendix® DRM™ dryer reservoir module, a Bendix® AD-9si, AD-HF®, or AD-HFi™ air dryer, be sure to drain the purge reservoir.
- ▲ Following the vehicle manufacturer's recommended procedures, deactivate the electrical system in a manner that safely removes all electrical power from the vehicle.
- ▲ Never exceed manufacturer's recommended pressures.
- ▲ You should consult the vehicle manufacturer's operating and service manuals, and any related literature, in conjunction with the Guidelines above.
- ▲ Never connect or disconnect a hose or line containing pressure; it may whip and/or cause hazardous airborne dust and dirt particles. Wear eye protection. Slowly open connections with care, and verify that no pressure is present. Never remove a component or plug unless you are certain all system pressure has been depleted.
- ▲ Use only genuine Bendix® brand replacement parts, components and kits. Replacement hardware, tubing, hose, fittings, wiring, etc. must be of equivalent size, type and strength as original equipment and be designed specifically for such applications and systems.
- ▲ Components with stripped threads or damaged parts should be replaced rather than repaired. Do not attempt repairs requiring machining or welding unless specifically stated and approved by the vehicle and component manufacturer.
- ▲ Prior to returning the vehicle to service, make certain all components and systems are restored to their proper operating condition.
- ▲ For vehicles with Automatic Traction Control (ATC), the ATC function must be disabled (ATC indicator lamp should be ON) prior to performing any vehicle maintenance where one or more wheels on a drive axle are lifted off the ground and moving.
- ▲ The power MUST be temporarily disconnected from the radar sensor whenever any tests USING A DYNAMOMETER are conducted on a vehicle equipped with a Bendix® Wingman® system.



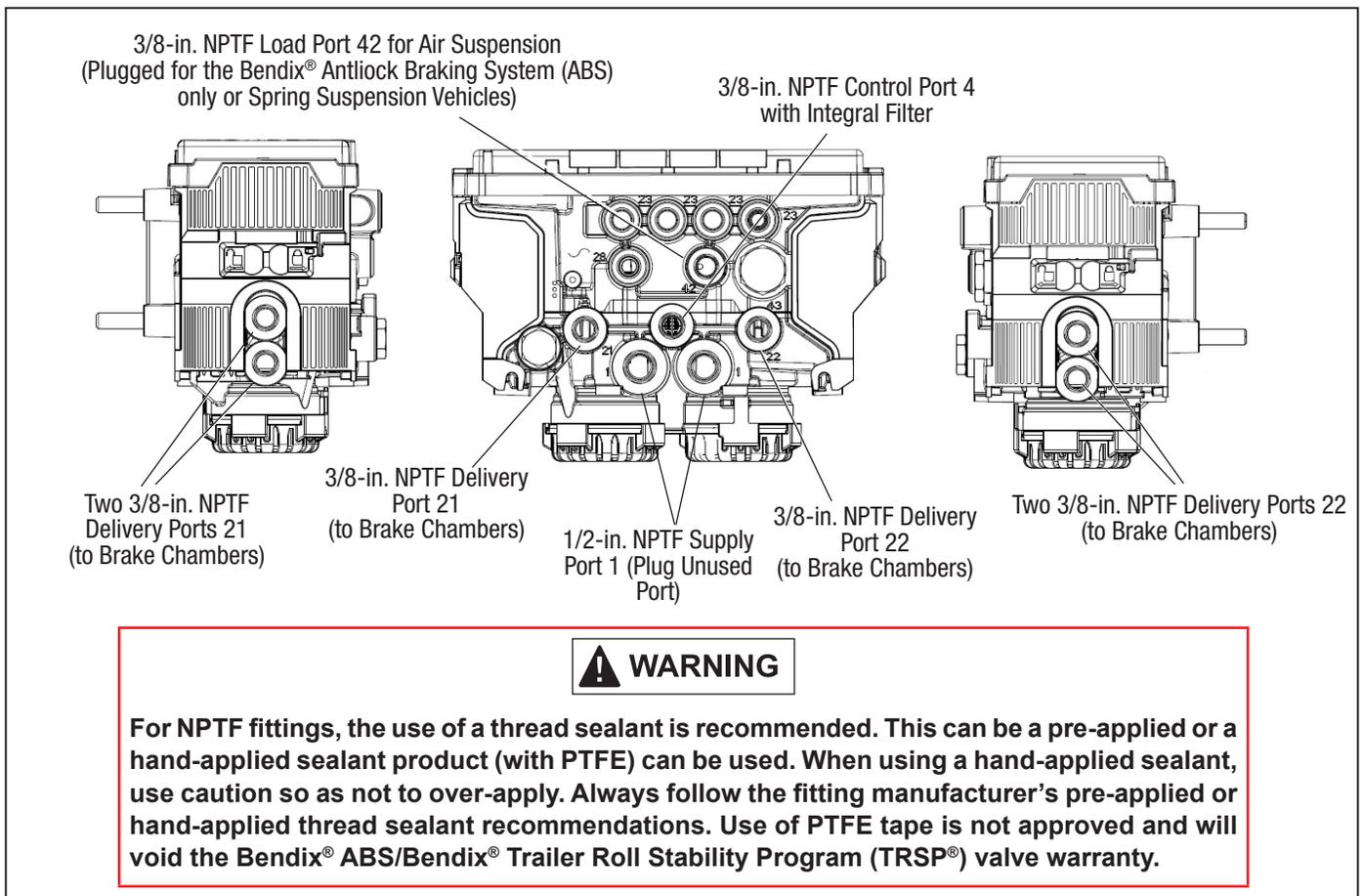
**WARNING**

Disconnect the electrical connectors from the Bendix® Antilock Braking System (ABS)/Bendix® Trailer Roll Stability Program (TRSP®) controller before welding on the trailer.



**WARNING**

Dielectric grease should be applied to electrical connectors to help protect against moisture intrusion.



**⚠ WARNING**

For NPTF fittings, the use of a thread sealant is recommended. This can be a pre-applied or a hand-applied sealant product (with PTFE) can be used. When using a hand-applied sealant, use caution so as not to over-apply. Always follow the fitting manufacturer’s pre-applied or hand-applied thread sealant recommendations. Use of PTFE tape is not approved and will void the Bendix® ABS/Bendix® Trailer Roll Stability Program (TRSP®) valve warranty.

Figure 2 – Ports Used

### 3. ANTILOCK BRAKING SYSTEM (ABS) OPERATION

The Bendix® TABS-6™ Advanced Multi-Channel (MC) module uses Wheel Speed Sensors (WSS), Modulator Relay Valves (MRVs), and an Electronic Control Unit (ECU) to optimize the contact between the tires and the road surface during a braking event where excessive wheel slip – or wheel lock-up – is detected.

When a situation is detected where the system needs to intervene, the ECU will activate the MRVs to apply controlled brake pressure at the wheel ends. Depending on the configuration of the ABS system, interventions may be made on individual wheels, or pairs of wheels. In the case of pairs of wheels, the wheels controlled by a modulator may be either on the same side of the vehicle, or at both ends of an axle.

The TABS-6 Advanced MC module ECU is typically able to modulate the brake pressure with greater speed and accuracy than a driver.

#### Normal Braking

During normal braking, the TABS-6 Advanced MC module functions as a standard relay valve. If the ECU does not detect excessive wheel slip, it will not activate the ABS system, and the vehicle will stop with normal braking.

**⚠ WARNING**

**Axle control (*select high*) and side control should not be used on fifth-wheel dollies or steerable axles. In these cases, it could cause a yaw moment during braking that results in unwanted steering of the axle. Use a dolly control (*select low*) configuration.**

#### Side Control (Independent Control)

Side control uses a single MRV to separately control the braking on one (1) or more wheels, on either side of the vehicle.

In the case of braking surfaces with poor overall traction, the side control ABS interventions will maintain the wheels on each side of the vehicle independently, at just under the speed where they would lock up.

**NOTE:** Side control should not be used on fifth-wheel dollies or steerable axles.

#### Axle Control

Axle control uses a single Modulator Relay Valve (MRV) to control the wheels at both ends of a given axle (or multiple axles in cases where a single MRV is controlling several axles).

In the case of braking surfaces with poor overall traction (e.g. roads that are worn, slippery, or are made of loose gravel) – or braking surfaces with areas of poor traction (e.g. asphalt roads with patches of ice) – axle control Antilock Braking System (ABS) interventions will maintain the wheel that is not slipping at just under the speed that will lock the wheel. The system permits the other wheel (that is experiencing slippage) temporary periods of wheel-lock during the intervention.

Axle control should not be used on fifth-wheel dollies or steerable axles.

When intervening on regular traction road surfaces, a system configured for axle control performs similar to a side-control, two-modulator system.

### Steerable Axles

For applications that have both fixed and steerable axles, such as drawbar trailers (full-pull trailers), a 4S2M axle configuration should be used. These configurations have the ability to minimize yaw on steerable axles.

### ABS Fail-Safe

The Bendix® TABS-6™ Advanced Multi-Channel (MC) module is designed to react in a fail-safe manner in the event of a system Diagnostic Trouble Code (DTC). For example, if the Electronic Control Unit (ECU) detects that a sensor is not responding, an ABS system DTC will be set and the TABS-6 Advanced MC module will illuminate the trailer ABS indicator lamp and revert to a fail-safe mode where some, or all, advanced ABS functions (including the Bendix® Trailer Roll Stability Program (TRSP®) may not function. Even in cases where the ABS system is completely disabled, the standard pneumatic brake function of the vehicle will still be available, but without the benefits of the ABS system. The TRSP feature is also disabled with an active ABS system DTC. If the indicator lamp is illuminated, always have the ABS system serviced at the earliest opportunity

## 4. BENDIX® TRAILER ROLL STABILITY PROGRAM (TRSP®) OPERATION



**During a TRSP system intervention, the vehicle automatically decelerates. The TABS-6 Advanced MC module can slow the vehicle with or without the driver applying the brake pedal, and even when the driver applies the throttle.**



**Even with TRSP-equipped vehicles, the driver remains responsible for ensuring vehicle stability during operation. The TRSP system only functions within the limits of physics. The system can help mitigate potential vehicle stability incidents, but cannot prevent them in all cases. Other factors – such as driving too fast for the road, traffic or weather conditions, over-steering, an excessively high vehicle Center of Gravity (CG), poor road conditions, or insufficient vehicle maintenance – can cause vehicle instability that is beyond the capability of any stability system to mitigate.**



**Operating the vehicle with a damaged/disconnected load sensor could lead to a serious accident. The advanced ABS system used on this vehicle uses sensors, including the load sensor, to assist the TRSP function.**



**The TRSP system should only be used on specific vehicle platforms that have been validated and approved by Bendix engineering.**



**For vehicles installed with spring suspension systems, care must be taken to prevent damage to the load sensor when lifting the trailer. The linkage rod must be disconnected from the sensor's rubber boot whenever the frame of the trailer is lifted, dropping the axle(s). This includes situations where a jack is used on the rear bumper or when a crane is used to lift the trailer.**

The TRSP system reduces the risk of rollovers during driving by automatic application of the service brakes when the system detects potential rollover conditions. This is accomplished with monitoring sensors both at the trailer wheel ends and within the TABS-6 Advanced MC module. The TRSP system reacts by applying the trailer service brakes and slowing the vehicle combination.

The Bendix® Trailer Roll Stability Program (TRSP®) system uses the following sensors:

- **Lateral Acceleration:** A lateral accelerometer is located within the Bendix® TABS-6™ Advanced Multi-Channel (MC) module. This sensor detects the lateral motion (or “roll”) of the vehicle as it moves. The TABS-6 Advanced MC module must be mounted either facing forward (0 degrees) or facing the rear (180 degrees) of the trailer to function correctly – See the *Troubleshooting section* for full details of acceptable installation locations. **NOTE:** Do not attempt to change the location of the module without contacting Bendix for engineering approval.
- **Vehicle Speed:** The TRSP system obtains information about the vehicle speed and rate of acceleration from the Wheel Speed Sensors (WSS).
- **Axle/Bogie Load:** The trailer’s axle load information is obtained either by the use of:
  - a. An integrated pressure sensor port (P42) of the TABS-6 Advanced MC module, where a direct reading of the suspension air spring pressure is taken; or
  - b. If configured for a mechanical spring deflection sensor, a voltage reading that is proportional to the spring deflection.

#### TRSP Intervention with Driver Actions

It is possible that the driver will also apply the brakes before or during a TRSP intervention by the TABS-6 Advanced MC module. In all cases, the Electronic Control Unit (ECU) monitors the driver’s brake application and compares that to the amount of braking the TRSP program has calculated needs to be applied. The pressure delivered to the brakes will always be the higher of the two (2) values.

## 5. COMPONENTS

Installations of the TABS-6 Advanced MC module use the following components:

#### Internal

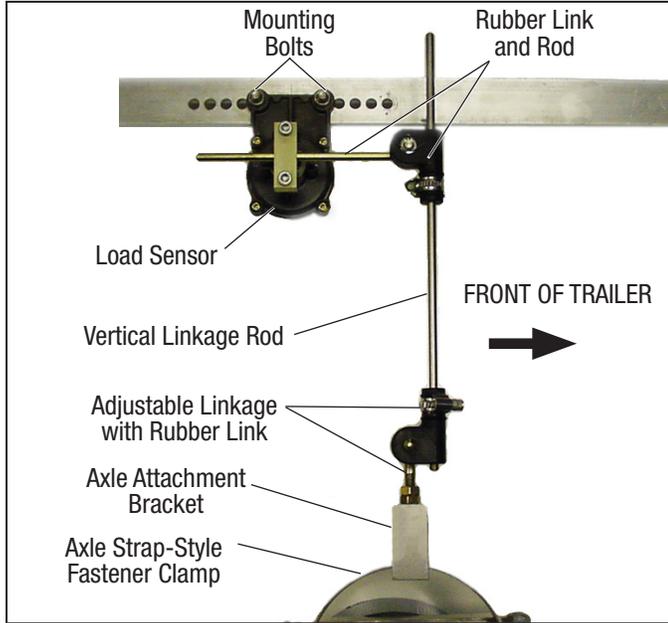
- **ECU:** The ECU monitors the WSS signals, lateral accelerometer sensor signal, and various pressure sensors (and, if configured, external spring deflection sensor) to determine when the Antilock Braking System (ABS) and/or TRSP intervention is required. When needed, the ECU actuates the appropriate pressure Modulator Relay Valves (MRVs) to optimize the brake pressure. The ECU monitors the system to detect and warn the driver of any malfunctions. Diagnostic Trouble Codes (DTCs) are stored in the ECU and can be reviewed to diagnose the TABS-6 Advanced MC module system.

- **Brake Demand Pressure Sensor:** This sensor monitors the trailer service brake pressure being applied by the driver and sends an electrical signal directly proportional to the driver’s brake demand to the ECU.
- **Brake Delivery Pressure Sensors:** These sensors (P21 and P22) monitor the trailer service brake pressure that is being delivered to the wheel ends through, or by, the TABS-6 Advanced MC module system and sends electrical signals directly proportional to the delivered trailer service brake pressure to the ECU.
- **Internal Load Sensor:** For air suspension systems, the load sensor port (P42) must be plumbed to a fixed axle air ride bellows. **NOTE:** The sensor must not be plumbed to lift axle bellows since they are not charged when the axle is not being used. The function of this sensor is to monitor the pressure and send an electrical signal directly proportional to the trailer’s axle load to the ECU.
- **Lateral Accelerometer Sensor:** The lateral accelerometer sensor senses the lateral movement of the trailer and sends an electrical signal directly proportional to the trailer’s lateral acceleration to the ECU.
- **Modulator Relay Valve (MRV):** MRVs are integrated into the module and are controlled electrically by the ECU to decrease, hold, or allow the fully applied brake pressure into the brake chamber to control the braking torque at the wheels.
- **Supply Pressure Sensor:** Supply pressure sensors are non-serviceable, and are located within the module.

#### External

- **External Load Sensor:** For spring suspension systems, an external electrical spring deflection sensor is installed – typically as close to the center ( $\pm 5$  in. / 12.7 cm) as possible of an axle with linkage attached to the center of the axle (but **MUST NOT** be installed on a lift axle), See *Figure 3*. Vehicles with a mechanical load sensor have the port (P42) used for sensing the air suspension system plugged.
- **Load Sensor:** See *Figure 3*. If a trailer is equipped with an external electrical spring deflection sensor, a linkage is attached to an axle (but must not be installed on a lift axle) – within five (5) in. (12.7 cm) of the center of the axle – connects to a load sensor attached to the chassis of the vehicle. The output from the sensor is an electrical signal that is proportional to the spring deflection. The connection to the ECU is via the auxiliary 12-pin or 2.4 connector.

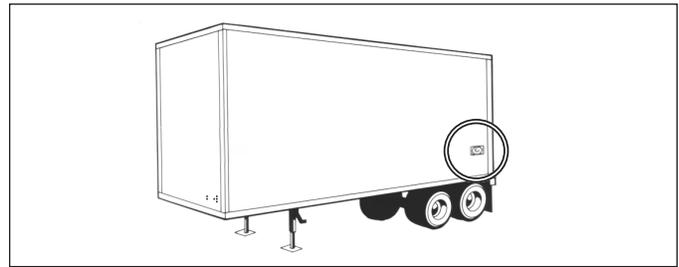
- **Lift Axle Sensing:** If a trailer is equipped with a lift axle, then lift axle sensing must be used, unless configured for automatic lift axle control (see below). A pressure threshold switch must be installed in the lift bag for the lift axle and connected to the Electronic Control Unit (ECU). The ECU can then monitor the position of the lift axle and will compensate correctly for the load transfer to the other axle(s) when the lift axle is raised.



**Figure 3 – Typical External Load Sensor Installation**

For more information, See *Installation Instruction S-1588, Spring Deflection Sensor*.

- **Lift Axle Control:** The Bendix® TABS-6™ Advanced Multi-Channel (MC) module can be configured to automatically raise (and lower) lift axle(s) when a pre-configured load is sensed.
- **Trailer Antilock Braking System (ABS) Indicator Lamp:** Controlled by the ECU to show the ABS status, the trailer ABS indicator lamp illuminates when a Diagnostic Trouble Code (DTC) is active. See Figure 4. If there are no ABS DTCs present, when ignition power is applied to the ECU, the lamp will illuminate as a bulb check lasting typically two (2) seconds, up to six (6) seconds at most. If Low Pressure Warning Emergency (LPWE) is active, the ABS indicator lamp will be on until the condition is clear.

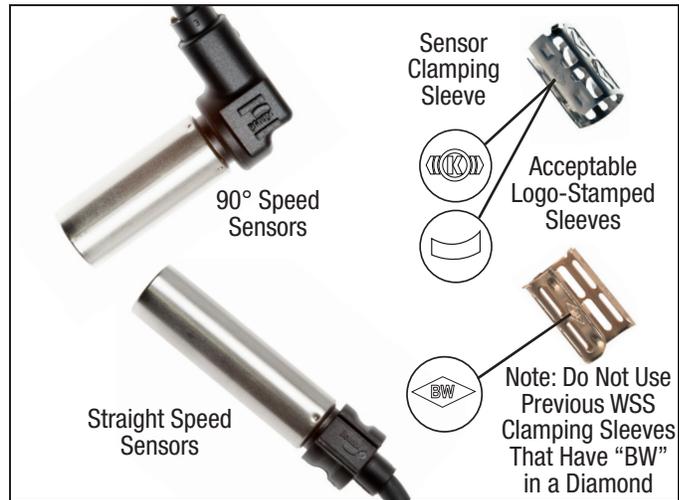


**Figure 4 – Trailer-Mounted ABS Indicator Lamp**

- **Wheel Speed Sensors (WSS):** Located at selected hubs, WSS detect the rotation of individual wheels and send an electrical signal to the ECU proportional to the rotational velocity. See Figure 5.
- **Pigtail Wiring Harness:** A power pigtail harness is required. Auxiliary harnesses are available, as needed. See Figure 6.



**Use of cable ties/tie wraps to attach WSS leads to rubber hoses/jounce lines is not approved. The hose may expand during braking due to air pressure and the cable tie may not, so the conductor material/insulation of the WSS extensions may be damaged. Bendix instead recommends only open-ended clips be used to hold sensor leads to jounce lines.**



**Figure 5 – Bendix® WS-24™ Wheel Speed Sensors**

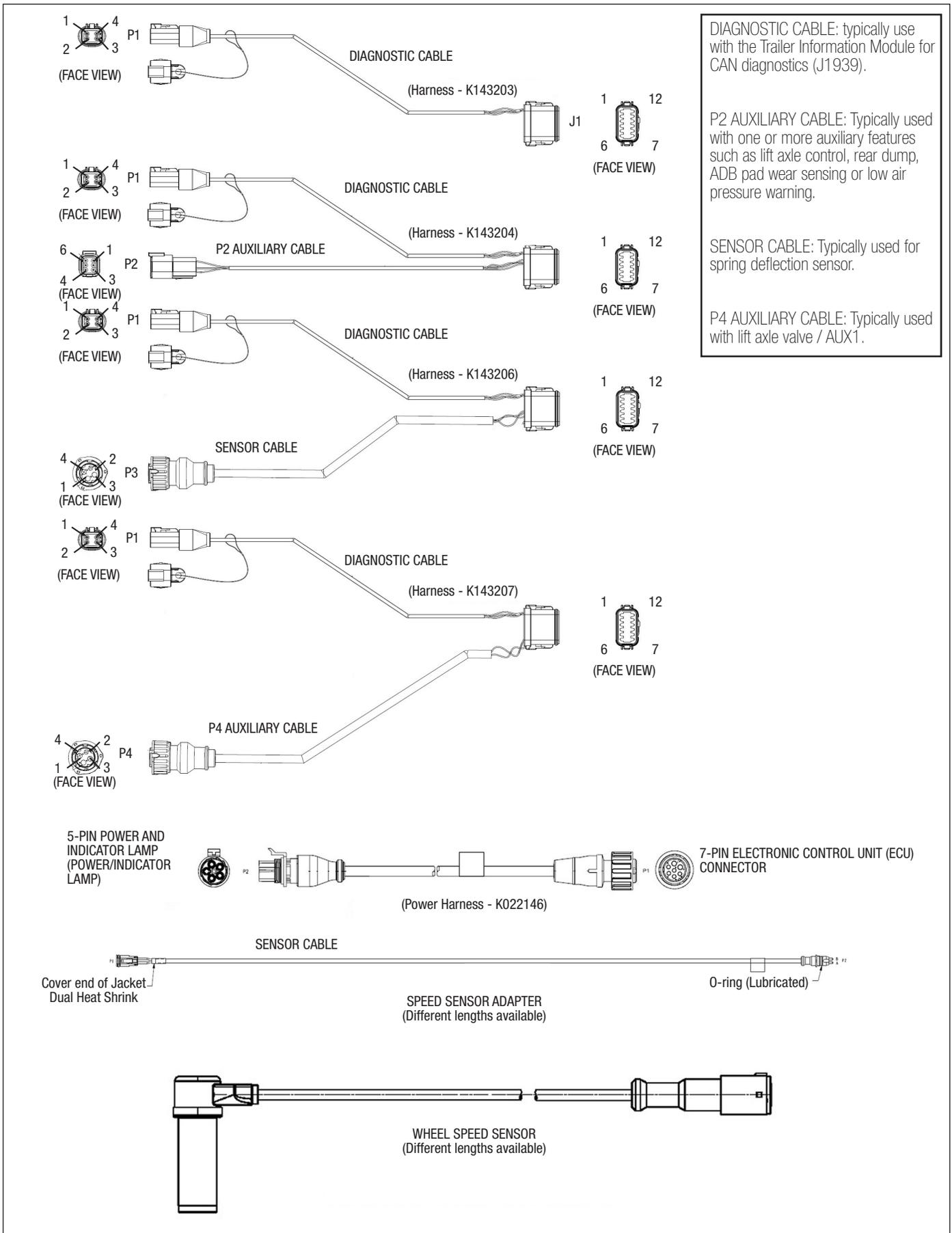


Figure 6 – Examples of Pigtail Wire Harnesses

## 6. MOUNTING

### Frame (Chassis) Mount

The Bendix® TABS-6™ Advanced Multi-Channel (MC) module provides three (3) M10, 1.18-in. (30 mm) studs for frame-mounting directly to a trailer cross-member. The TABS-6 Advanced MC module uses three (3) Class-8 steel M10x1.5 lock nuts with washers, torqued to 354 ± 44.4 in.-lbs (40±5 N•m). A bracket may be used if direct mounting to a cross-member is not possible.

## 7. PIGTAIL WIRING HARNESES

See Figure 6. Several pigtail wire harnesses are available to connect the TABS-6 Advanced MC module with other trailer system components. Pigtail harnesses are weather-sealed at the connector interface and are clearly labeled for proper installation. Because of the over-molded design of the wiring harnesses, Bendix recommends that if damage or corrosion occurs, the complete harness be replaced.

### Wheel Speed Sensor (WSS) Connectors

The TABS-6 Advanced MC module includes two (2) primary and two (2) secondary WSS connections separate from the main vehicle pigtail harnesses, and each requires a separate harness. The connector of each WSS is a 2-pin Deutsch DT series.

### Electronic Control Unit (ECU) Connectors

The TABS-6 Advanced MC module ECU has four (4) connectors (in addition to the WSS connectors mentioned above). The primary connector is a 7-pin custom series screw-on-type connector used to connect to the vehicle's power pigtail harness. The main connector is a 12-pin Deutsch-DT-series-style connector, used for auxiliary inputs and outputs (I/Os). Finally, the auxiliary connectors 2.3 and 2.4 are 6-pin Deutsch-DT-series-style connectors, used for additional auxiliary inputs and outputs (I/Os).

## Power and Ground

Trailer electrical power is supplied to the TABS-6 Advanced MC module from the ignition and brake light circuits.

See Tables 1 and 2 for output values and pin locations.

Function Mode	Value
Operating Range	8.0 to 32.0 VDC
ECU Active	150 mA @ 12 VDC
Antilock Braking System (ABS) Active	2.0 A @ 12 VDC

Table 1 – Values for Outputs

Circuit	7-Pin Trailer Conn.	5-Pin ABS Conn.	7-Pin ECU Conn.
Ignition Power PLC (Blue Wire)	7	B	1
Brake Light Power (Red Wire)	4	A	2
Ground (White Wire)	1	E	4
Indicator Lamp (White/Green Wire)	N/A	D	5
TT-CAN Hi* (White/Green Wire)	N/A	N/A	6
TT-CAN Lo* (White/Brown Wire)	N/A	N/A	7

\*Tractor Trailer CAN is only available for ECUs labeled with a component index of M002 and higher.

Table 2 – Main Power Harness and Connectors Pin Out

### Power/ABS Indicator Lamp Connector

The TABS-6 Advanced MC module pigtail uses a TTMA RP 97-99 5-pin Packard Weather Pack connector for brake light power, constant power, ground, and the trailer-mounted ABS indicator lamp.

### SAE J1939 (CAN) Connector

See Figure 6.

The TABS-6 Advanced MC module 12-pin auxiliary harnesses typically include a 4-pin connector used for various ECU communications. Typical uses include J1939 diagnostics and connection to the Bendix® Trailer Information Module (TIM).

## Auxiliary I/O Connector

The Bendix® TABS-6™ Advanced Multi-Channel (MC) module provides an option for up to six (6) auxiliary I/Os. For a pin-out, see *Section 12*.

Examples of uses of the auxiliary connectors are:

- Lift axle sensing
- Rear axle suspension air bag dump
- SAE J1939 diagnostics
- Automatic lift axle control
- External spring deflection sensor for mechanical spring suspension

## 8. ANTILOCK BRAKING SYSTEM (ABS) INDICATOR LAMP

### Trailer-Mounted Lamp

The TABS-6 Advanced MC module controls an ABS indicator lamp to show the trailer ABS status. With power supplied by the towing vehicle – if there is an active Diagnostic Trouble Code (DTC), or during the bulb test at startup – the module illuminates the ABS indicator lamp by providing a 12.0 VDC signal. (The other side of the lamp is grounded.) The ABS indicator lamp output uses pin 5 of the 7-pin connector on the module.

### Dash-Mounted Lamp (PLC-Controlled)

The TABS-6 Advanced MC modules use SAE J2497 standards to support Power Line Carrier (PLC) communication. The status of the trailer ABS is transmitted over the ignition power wire (the blue wire of the J560 connector) – pin 1 of the 7-pin module connector.

If there is an active DTC during the bulb check at startup, the TABS-6 Advanced MC module will transmit a signal over the power line to the towing vehicle's Electronic Control Unit (ECU). The towing vehicle's ABS controller will then illuminate the trailer ABS indicator lamp mounted on the dash.

## 9. BENDIX® WS-24™ WHEEL SPEED SENSORS (WSS)

See *Figure 5*. Wheel speed data is provided to the TABS-6 Advanced MC module by the Bendix® WS-24™ Wheel Speed Sensors (WSS). Typically, the WS-24 WSS is installed in a mounting block that is welded to the axle housing. The WS-24 WSS are protected by a stainless steel sheath and are designed to be used with stainless steel clamping sleeves (sometimes referred to as a “retainer bushing”, “friction sleeve”, or “clip”) (See *Figure 5*). The clamping sleeve provides a friction fit between the mounting block bore and the WS-24 WSS.

Vehicles have an exciter ring (or “tone ring”) as part of the wheel assembly. (The default setting expects a 100-tooth tone ring to be used. See *Troubleshooting: Section E* for more information.) As the wheel turns, the teeth of the exciter ring pass the WSS, generating an AC signal which is delivered to the TABS-6 Advanced MC module ECU. The signal varies in voltage and frequency as the wheel speed changes.

Vehicle axle and ABS control configurations determine if two (2) or four (4) WSS are required. See *Figures 20 and 21* for an electrical system schematic showing WSS connector pin locations.

**NOTE:** If the trailer is equipped with a lift axle that will use WSS, it is important that secondary sensors SE and SF be used for this axle. See *the system diagrams included in this document*. In all cases, the primary WSS must be located on the fixed axle. For 2S/2M systems, the fixed axle sensors are SC and SD.

1. For increased corrosion protection, Bendix recommends that a high-temperature-rated silicone- or lithium-based grease be applied to the interior of the mounting block, the sensor, and to a new clamping sleeve.
2. Install the new clamping sleeve fully into the block, with the retaining tabs toward the inside of the vehicle. Please note that Bendix WS-24 WSS must use the correct clamping sleeve to avoid problems associated with reduced retention force, such as sensor movement and resulting in ABS DTCs. See *Figure 5*.
3. Gently push (DO NOT STRIKE) the sensor into the mounting block hole until it bottoms out on the face of the tone ring. Secure the cable lead wire to the knuckle/ axle housing 3-6 in. (7.62-15.24 cm) from the WSS.
4. Apply a small amount of dielectric non-conductive grease to both the WSS and the harness connectors.
5. Engage the connectors and push them together until the lock tab snaps into place. It is permissible to use an extra wire retainer (Bendix part number 300122, or equivalent), if available, to hold the connectors together.

The friction fit allows the WS-24 WSS to slide back and forth under force, but to retain its position when the force is removed. When the WS-24 WSS is inserted all the way into the mounting block and the wheel is installed on the axle, the hub exciter contacts the sensor, which pushes the WSS back. Also, normal bearing play will “bump” the WSS away from the exciter. The combination of these two (2) actions will establish a running clearance, or air gap, between the WSS and the exciter.



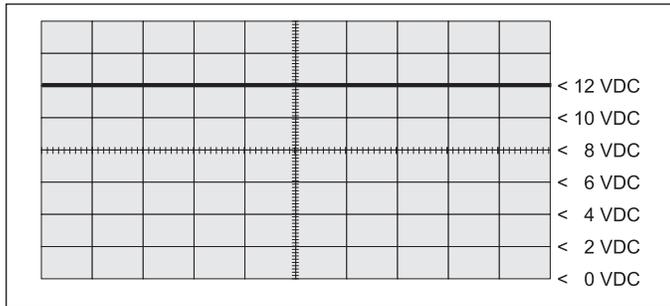
**Correct Wheel Speed Sensor (WSS) installation is necessary for optimal Antilock Braking System (ABS) operation.**



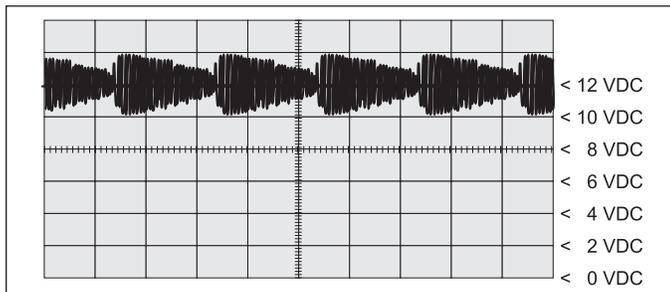
**Wheel bearing maintenance is an important part of keeping the WSS in the correct position. Excessive wheel end play can result in Diagnostic Trouble Codes (DTCs) in cases where the WSS is pushed too far away from the tone ring for a good signal to be produced. Maintain wheel bearings per the manufacturer's recommendations.**

## 10. SAE J2497 (PLC) DIAGNOSTIC LINK

All newer towed vehicles transmit a signal over the power line to the towing vehicle ABS Electronic Control Unit (ECU). The signal, using a heavy vehicle industry standard known as Power Line Carrier (PLC/J2497), is broadcast by the trailer ABS ECU over the blue wire (ignition power line) of the SAE J560 connector and controls an in-cab trailer ABS indicator lamp. See Figures 7 and 8.



**Figure 7 – Power Line Without PLC Signal**



**Figure 8 – Power Line With PLC Signal**

The Bendix® TABS-6™ Advanced Multi-Channel (MC) module provides a data link for PLC communication following the SAE J2497 standard.

Bendix® ACom® PRO™ diagnostic software and the Bendix® Trailer Remote Diagnostic Unit (TRDU™) both support PLC communication with the TABS-6 Advanced MC module.

PLC communication is applicable for 12-volt vehicle applications only. The PLC communication is disabled for voltages greater than 18 volts.

### Identifying and Measuring the PLC Signal

The TABS-6 Advanced MC module will continuously broadcast PLC messages that indicate trailer ABS status. At power-up, or during a trailer DTC condition, the TABS-6 Advanced MC module will signal the tractor ABS unit to illuminate the dash-mounted trailer ABS indicator lamp.

Diagnostic tools are available that detect the presence of a PLC signal and perform further system diagnostics directly using the power line. For more information on these diagnostic tools, contact Bendix or refer to your local authorized Bendix dealer or distributor.

An oscilloscope can also be used to verify the presence and strength of a PLC signal on the power line. The PLC signal is an amplitude- and frequency-modulated signal. Depending on the load on the power line, the amplitude of the PLC signal can range from 2.5 mV p-p to 7.0 V p-p.

Suggested oscilloscope settings are: AC coupling, 1 volt/div, 100 μsec/div. The signal should be measured on pin 7 of the J560 connector at the nose of the trailer.

## 11. SAE J1939 (CAN) DIAGNOSTIC LINK

The TABS-6 Advanced MC module provides a data link for transmitting CAN information following the SAE J1939 standard.

ACom PRO diagnostic software and the Bendix Trailer Information Module both support CAN communication with the TABS-6 Advanced MC module.

Ignition power must be provided to the TABS-6 Advanced MC module for the diagnostic link to be active.

## 12. AUXILIARY I/O

The Bendix® TABS-6™ Advanced Multi-Channel (MC) module provides for up to six (6) auxiliary input/output (I/O) functions. Refer to Table 3.

Bendix® ACom® PRO™ diagnostic software supports the configuration of the TABS-6 Advanced MC module auxiliary I/Os.

Name	ECU Conn.	Pin No.	Auxiliary Functions	Auxiliary Type	
Aux I/O 1 (AuxIO1)	12-Pin ECU Conn. (X2)	1	High-Side Driver	Output	
			Digital Input	Input	
Aux I/O 2 (AuxIO2)		2	High-Side Driver	Output	
			Digital Input	Input	
Aux I/O 3 (AuxIO3)		3	High-Side Driver	Output	
			Digital Input	Input	
AuxRet 12		12	Low-Side Driver	Output	
AuxRet 3		11	Low-Side Driver	Output	
Sens_Sup		6	+5V Sensor Supply	Output	
Sens_In		5	Analog Input	Input	
Sens_Gnd		4	Low-Side Driver	Input	
Aux I/O 4 (AuxIO4)		6-Pin 2.3 (X3)	1	High-Side Driver	Output
	Digital Input			Input	
Aux I/O 5 (AuxIO5)	3		High-Side Driver	Output	
			Digital Input	Input	
AuxRet 4	2		Low-Side Driver	Output	
AuxRet 5	4		Low-Side Driver	Output	
Aux I/O 6 (AuxIO6)	6-Pin 2.4 (X4)		3	High-Side Driver	Input
				Digital Input	Output
AuxRet 6			4	Low-Side Driver	Output
Sens_Sup2		1	+5V Sensor Supply	Output	
Sens_In2		5	Analog Input	Input	
Sens_Gnd		2	Low-Side Driver	Input	

**Table 3 – Auxiliary I/Os**

## 13. BENDIX® ANTILOCK BRAKING SYSTEM (ABS) FLEX™ PROGRAM

The Bendix® ABS Flex™ program uses Auxiliary Design Language (ADL) to allow customized auxiliary functions to be carried out by the TABS-6 Advanced MC module. Programs developed in the ABS Flex program may be downloaded at the production line or in the field to control non-braking functions of the trailer.

For example, the ABS Flex program can potentially communicate the status of tire inflation and/or temperature, reefer temperature, load presence, lift axle position, proximity/reverse alarm, and vehicle weight.

ABS Flex programs monitor the auxiliary I/Os and/or the SAE J1939 (CAN) and SAE J2497 (PLC) data links. Contact your Bendix Account Manager to discuss an ABS Flex program for your vehicle(s).

## 14. CUSTOMER SCRATCH PAD

The TABS-6 Advanced MC module has a customer scratch pad feature which allows the customer, or end-user, to store up to 1,008 bytes of information. This information can then be read using the ACom PRO diagnostic software.

## 15. POWER-UP SEQUENCE

At power-up, the TABS-6 Advanced MC module performs a series of self-checks that can assist a technician to determine the ABS system status and configuration.

### Trailer ABS Indicator Lamp

At power-up, with no active Diagnostic Trouble Codes (DTCs), the trailer ABS indicator lamp will illuminate for approximately two (2) to six (6) seconds as a bulb check and then turn off. See Figure 9.

The Low Pressure Warning Service feature is configured by default. This feature will alert the driver whenever the pressure of the reservoir is below 65 psi via an active DTC that will illuminate the ABS indicator lamp. Once the pressure has reach above 65 psi, the DTC will clear and the lamp will turn off.

If any active ABS or related DTCs are present, the trailer ABS indicator lamp will remain illuminated.

For non-ABS or Bendix® Trailer Roll Stability Program (TRSP®)-related DTCs, such as auxiliary functions, at power-up, the trailer ABS indicator lamp will turn on for approximately six and a half (6.5) seconds as an extended bulb check, and then turn off.

If a PLC-ready towing vehicle and trailer are powered at the same time, the TABS-6 Advanced MC module will also trigger a bulb check on the dash-mounted trailer ABS indicator lamp.

### Modulator Chuff Test at Power-Up

At power-up, the Bendix® TABS-6™ Advanced Multi-Channel (MC) module activates a modulator chuff test. This electrical and pneumatic Antilock Braking System (ABS) modulator test can help the technician identify problems with modulator installations and/or wiring.

With a full reservoir, brake pressure and a properly installed modulator on power-up will cause two (2) rapid groups of five (5) audible air pressure pulses. The TABS-6 Advanced MC module will not perform a modulator chuff test with an active ABS Diagnostic Trouble Code (DTC).

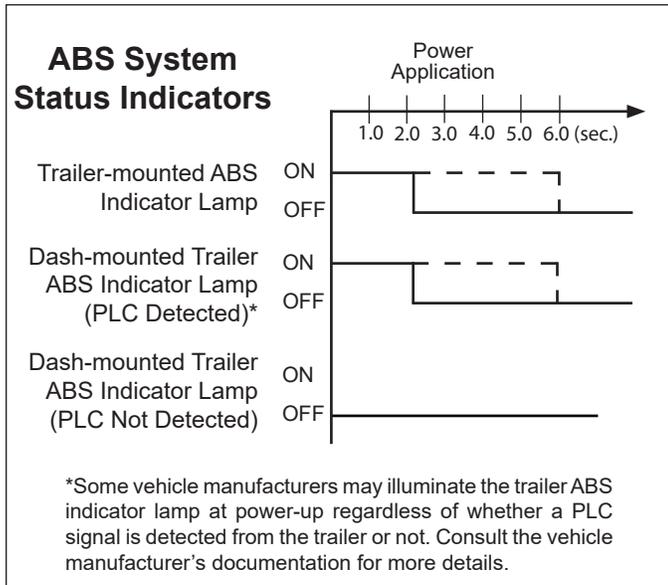


Figure 9 – Trailer ABS Lamp Power-Up Sequence

## 16. ODOMETER FUNCTION

### Odometer

The TABS-6 Advanced MC module includes an odometer function to provide a means of storing the accumulated mileage of the vehicle. The mileage is computed by using information received from the vehicle Wheel Speed Sensors (WSS).

This feature is accurate to within 0.62 miles per power-up and will typically store mileage up to 1,000,000 miles. The mileage can be displayed using the Bendix® ACom® PRO™ diagnostic software, a Bendix® Trailer Information Module, Bendix® Trailer Remote Diagnostic Unit (TRDU™), or through blink codes.

Whenever the TABS-6 Advanced MC module is towed using a pre-1997 tractor (with no constant power supplied to the trailer), no information about mileage will be stored during that time, and the mileage can be considered out of calibration.

### Trip Counter

The TABS-6 Advanced MC module provides a counter to record the trip mileage. The feature can be accessed using the ACom PRO diagnostic software or the Trailer Information Module.

### Service Interval

The TABS-6 Advanced MC module provides a feature that can be used to indicate a service interval for the trailer. The service interval can be accessed using the ACom PRO diagnostic software or the Trailer Information Module. If configured, the TABS-6 Advanced MC module can flash the indicator lamp when the vehicle is at a standstill to indicate when the service interval has been exceeded.

## 17. NON-STANDARD TIRE SIZE

The TABS-6 Advanced MC module allows for tire rolling radius and tone ring tooth count parameters to be set for the axle being sensed using the ACom PRO diagnostic software. These adjustments may be necessary for the module to accurately calculate the vehicle velocity and odometer mileage. Wheels of the same axle must have, and be set to the same, rolling radius and tone ring tooth count. Refer to the manufacturer's tire specification for correct values.

The tone ring size is defaulted to 100 teeth, and the tire-rolling radius is defaulted to 511 rpm. These parameters can be adjusted as shown in Table 4.

Tone Ring Size	Tire Rolling Radius Allowable Range in Revolutions Per Mile (rpm)
60 teeth	712 to 1005 rpm
80 teeth	512 to 801 rpm
90 teeth	456 to 711 rpm
100 teeth	410 to 640 rpm
120 teeth	356 to 502 rpm

Table 4 – Tone Ring Size to Tire Rolling Radius

## 18. DIAGNOSTIC TROUBLE CODE (DTC) DETECTION

The Bendix® TABS-6™ Advanced Multi-Channel (MC) module contains self-testing diagnostic circuitry that monitors the Antilock Braking System (ABS) components and wiring.

When the TABS-6 Advanced MC module senses an erroneous system condition, it activates the external trailer-mounted ABS indicator lamp, disables all or part of the affected ABS and/or the Bendix® Trailer Roll Stability Program (TRSP®) functions, and it stores the DTC in memory, so that the information is retained even when the power is removed. The TABS-6 Advanced MC module also uses PLC communications to send the system status to the towing vehicle.

For some DTCs, the TABS-6 Advanced MC module will automatically reset (“self-heal”) the active DTC when the error is corrected [e.g. when a Wheel Speed Sensor (WSS) is re-aligned]. However, repeated occurrences of a given DTC can cause the code to “latch” – that is, be retained as active – even if the condition is only intermittent. Once the code is latched, a manual reset will be necessary. Technicians can use these latched codes to assist them in troubleshooting intermittent errors. After the problem is repaired, the DTC can be reset using blink code diagnostics or with a diagnostic tool.

When a DTC self-heals or is manually reset, the code remains stored as an inactive DTC in the Electronic Control Unit (ECU) memory. This inactive DTC can be retrieved using blink code diagnostics or with a diagnostic tool.

## 19. PARTIAL ABS SHUTDOWN

Depending on the DTC detected, the ABS ECU will partially or completely disable the ABS and/or TRSP functionality. In cases where the ABS is completely disabled, the vehicle reverts to normal braking (without ABS or TRSP interventions). Always repair ABS DTCs at the earliest opportunity.

### ECU DTCs

All ABS functions are completely disabled. The system reverts to normal braking.

### Voltage Diagnostic Trouble Code

The operating voltage range is 8.0 to 32.0 VDC. If the voltage is detected as being out of range, the ABS and TRSP system braking features will be disabled, and the system reverts to normal braking. When the correct voltage level is restored, full ABS and TRSP functionality is typically available again.

## 20. BLINK CODE DIAGNOSTICS

The TABS-6 Advanced MC module provides diagnostic functions through blink code diagnostics. This means that the technician – even without diagnostic tools – can read a series of ABS indicator lamp blinks to diagnose the DTCs being generated.

With no towing vehicle attached, enter the blink code diagnostics mode by providing constant power to the ignition circuit then toggling the brake light power input the specific number of times shown in *Table 5*, for the desired mode.

With a parked towing vehicle attached, apply ignition power, and after the power-up sequence is complete, enter the diagnostics mode by depressing and releasing the brake pedal the specific number of times shown in *Table 5*, for the desired mode.

Cycles to Enter Desired Mode	
Mode	Cycles
Active DTC Retrieval	3
Inactive DTC Retrieval (DTC History)	4
Clear Active DTCs	5
Odometer Mileage Display	7

**Table 5 – Blink Code Information**

Depending on the blink code mode activated, the TABS-6 Advanced MC module will blink the trailer-mounted ABS indicator lamp to display active DTC codes, inactive DTCs, and odometer mileage. Blink code diagnostics can also be used to clear active DTCs.

Wait until after the modulator chuff test before activating the brake light power. Alternatively, wait five (5) seconds.

**NOTE:** If certain DTCs are set, typically where modulator DTCs have occurred, the chuff test may not run.

Following a single display of all available messages, the ABS indicator lamp will remain on for five (5) seconds and then return to normal operating mode. Blink code diagnostics can only be activated following a power-up, where wheel speeds have not been detected. If the vehicle moves during the blink code diagnostics mode, the TABS-6 Advanced MC module will cancel the blink code diagnostics and return to normal operating mode.

Blink code diagnostics must be activated within the first 15 seconds of ignition power being applied.

If brake light power is continuously applied for greater than five (5) seconds, blink code diagnostics will be disabled until the next time the ignition power is cycled.

**NOTE:** Blink codes are not unique and can be shared between faults, generally of the same type. If there are doubts over which DTC has occurred, based on the blink code, try using a diagnostic tool to obtain the unique fault code.

### **Display Active Diagnostic Trouble Codes (DTCs)**

To display active DTCs, apply ignition power and depress and release the brake pedal three (3) times within 15 seconds (allowing one [1] second between each application). Following this activation, there will be a five (5) second delay followed by a blink code display sequence of all active DTCs.

### **Display Inactive DTCs**

To display inactive DTCs – those that are not currently set, but have occurred and are stored in the Electronic Control Unit (ECUs) memory – apply ignition power and depress and release the brake pedal four (4) times within 15 seconds. Following this activation, there will be a five (5) second delay followed by a blink code display sequence of all inactive DTCs stored.

### **Reset Active DTCs**

To reset active DTCs, apply ignition power and depress and release the brake pedal five (5) times within 15 seconds. Following activation, there will be a five (5) second delay followed by:

- a. If no DTCs remain, a blink code message of 1-1, (System Fully Operational - No DTCs Detected) and the Antilock Braking System (ABS) indicator lamp will cease to be illuminated; or
- b. If there are remaining active DTCs, a sequence of blink codes will display all of the remaining active DTCs, and the ABS indicator lamp will stay on.

Resetting active DTCs with blink code diagnostics does not clear information from DTC history. Both blink code diagnostics or diagnostic tools can retrieve inactive DTCs, but only diagnostic tools can clear this information.

### **Display Odometer Mileage**

To display the trailer odometer mileage, apply ignition power and depress and release the brake pedal seven (7) times within 15 seconds. Following activation, there will be a five (5) second delay followed by a blink code display of the odometer information (x1000).

E.g. 152,431 miles will be displayed as: 152 (x1000) or one (1) blink (pause); five (5) blinks (pause); two (2) blinks.

Zeros will be displayed by the ABS indicator lamp strobing twice.

Odometer mileage cannot be altered with blink code diagnostics. Complete odometer information can be retrieved using a diagnostic tool.

## **21. AUXILIARY FEATURES**

### **Low-Pressure Warning Service (LPWS) – Active by Default**

The internal pressure sensor on the P1 port the Bendix® TABS-6™ Advanced Multi-Channel (MC) module monitors the pressure on the trailer reservoir and alerts the driver when the pressure is below 65 psi by illuminating the ABS indicator lamp. The fault will become inactive dynamically once the pressure of the reservoir is above 65 psi. The P1 port pressure is available via TI-CAN and TT-CAN.

### **Low-Pressure Warning Emergency (LPWE)**

By monitoring the status of an external pressure switch installed on the emergency line at the spring brake valve, the ECU is capable of alerting the driver through the ABS indicator lamp, when the vehicle is in movement and the pressure on the emergency line has not reached 65 psi (the minimum pressure required to release the spring brakes). The speed threshold at which the alert activates is configurable. The fault will become inactive dynamically once the emergency line pressure is above 65 psi. It is optional to enable the broadcast of the switch status.

### **Automatic Lift Axle Control (LAC)**

The TABS-6 Advanced MC module can be configured to automatically raise a lift axle, or group of lift axles, when the load on the trailer drops below a configured weight. At least one (1) of the auxiliary outputs on the TABS-6 Advanced MC module must be configured to provide an electrical signal to operate the lift axle valve.

The TABS-6 Advanced MC lift axle control sub-system ensures that the legal requirements are fulfilled by preventing overloading of the axles.

Two (2) LAC outputs are available (LAC1 and LAC2) to allow for independent control of the lift axles.

### **Traction Help (TH)**

The TH function temporarily controls the lift axles of the trailer such that a higher load is imposed on the drive axles of the towing vehicle in order to improve traction. The TH function is only available when configured for automatic LAC.

## Maneuvering Help

This function is designed to always reduce the effective wheelbase of the trailer, regardless of where the lift axles are located, thereby enabling the trailer to be maneuvered more easily in confined spaces and reducing the possibility of tire scrubbing. When Maneuvering Help is configured and activated, the Bendix® TABS-6™ Advanced Multi-Channel (MC) module controls the appropriate trailer lift axles such that the effective wheelbase is temporarily reduced. This function is only available up to a low speed threshold above which the controlled axles will return to their normal automatic control mode. This function is only available when configured for automatic Lift Axle Control (LAC).

## Lower Lift Axle (LLA)

Forcing a lifted axle to lower when the automatic control dictates that it should be in the lifted position is often a desirable function and has been integrated in the TABS-6 Advanced MC module. LLA is only available when configured for automatic LAC.

## Advanced LAC

Advanced LAC is a combined function which offers the Traction Help (TH) and LLA functions via the same input. The following logic is implemented (for momentary switch only):

- TH: the signal is active for less than five (5) seconds
- LLA: the signal is active for more than five (5) seconds and less than 10 seconds
- Normal LAC Mode: the signal is active for more than 10 seconds and will be ignored

Advanced LAC is only available when configured for automatic LAC.

## Lift Axle Status (LAS1 – LAS2)

LAS1 and LAS2 monitor the status of the lift axles to determine if the axle(s) has been lifted. When enabled for the Bendix® Trailer Roll Stability Program (TRSP®), the status of the lift axle(s) is used to properly calculate the trailer weight based on the suspension's load input for the optimum TRSP performance. Two (2) lift axle status inputs are available – LAS1 and LAS2 – each connected to one (1) or two (2) lift axles.

## Tire Inflation System (TIS) Sensing

The TABS-6 Advanced MC will monitor the state of the TIS flow switch and transmit the status upon request through PID-042 of the J1587 protocol. Additionally, it is possible to configure an Electronic Control Unit (ECU) controlled lamp to indicate the state of the TIS.

## Pad Wear-Sensing

The TABS-6 Advanced MC will monitor the state of the pad wear sensors installed on the air disc brakes. It will activate a Diagnostic Trouble Code (DTC) whenever it detects that at least one (1) of the pads has reached the wear limit.

## Speed Pulse

In conventional suspension control systems, the raise/lower valve is often not reset to the drive position before the vehicle is moved, and damage can be caused to the suspension and brakes. To prevent this from happening, the ECU can be programmed to supply an electrical signal to the raise/lower valve. When the vehicle exceeds a pre-determined threshold speed, this signal causes the raise/lower valve to automatically switch to the drive position. The switching "ON" threshold can be set to any speed within the range 2.5 to 25 mph, with a signal duration of five (5) to 30 seconds. The switching "OFF" threshold is pre-set and non-adjustable.

## Independent Speed Switch (ISS)

The ISS provides an electrical output signal when a pre-programmed vehicle speed has been reached. This signal may be used to fulfill numerous operational requirements such as locking of the steering axles, rear dump, etc. The switching "ON" threshold can be set to any speed within the range 2.5 to 75 mph. The switching "OFF" threshold can be set to any value within 1.3 mph of the switching "ON" (minimum hysteresis is 1.3 mph).

## Antilock Braking System (ABS) Active

ABS active provides a trailer output signal whenever an ABS intervention occurs on the trailer. This function is typically used to provide an ABS active signal to a telematics device. In addition, with the aid of this function, it is possible to use the signal to engage a stabilizing function for steering axles.

### **Roll Stability Program (RSP) Active**

RSP active provides a trailer output signal whenever a Bendix® Trailer Roll Stability Program (TRSP®) intervention occurs on the trailer. This function is typically used to activate a signal to a telematics device or activate the trailer's brake lamps via a relay during TRSP.

### **Steering Axle Lock (SAL)**

SAL provides a speed-related output signal that may be used for connection to a steering axle locking mechanism. This output signal is a combination of an Independent Speed Switch (ISS) and Antilock Braking System (ABS) active. While it may be used for the locking of steering axles via a solenoid valve using an electrical output, it may also be used for other functions where the operation is to be speed-controlled.

### **Voltage Supply**

The voltage supply provides power to other systems on the trailer associated with braking and running gear functions (brakes, chassis, suspensions, and tires). The power supply for other functions must use a different power source. The maximum current available from each configured AUX I/O output is 1.5 amps.

### **Tilt Angle**

The tilt angle function uses the lateral accelerometer integrated in the Bendix® TABS-6™ Advanced Multi-Channel (MC) module to monitor any lateral tilting of the trailer during the tipping operation. If the tilt angle exceeds a programmable threshold, then the TABS-6 Advanced MC module will generate an electrical output which can be used as a driver warning or tipping intervention. The warning is only available up to a configurable speed threshold.

### **Rear Axle Suspension Dump**

Some spread-axle trailers are equipped with a rear axle suspension air bag dump feature to assist with cornering at low speeds. The TABS-6 Advanced MC module may be configured to use this feature. When this feature is used below a pre-determined vehicle speed threshold, the Electronic Control Unit (ECU) will partially exhaust the rear axle air suspension air bags, and then re-inflate them when the vehicle speed rises above the pre-determined threshold.

### **Dome Lamp**

Acting as a virtual switch, another device on the CAN network (e.g. a telematics unit) can request that a dome lamp, controlled by an auxiliary output on the TABS-6 Advanced MC module, can be turned on.

The dome lamp can be configured to automatically turn off, regardless of the state of the virtual switch, if the TABS-6 Advanced MC module detects that the trailer is moving above a configured speed. This feature can be turned off by setting the speed to 0 mph.

**NOTE:** The dome lamp needs to be hard-wired to an auxiliary output on the TABS-6 Advanced MC module.

### **Door Status**

The TABS-6 Advanced MC module monitors the status of the external door switch connected to one (1) of the auxiliaries and broadcasts the status of the switch through TI-CAN. It is also possible to configure the broadcast of the status through PID 379 of the J1587 protocol on PLC.

## 22. DIAGNOSTIC TROUBLE CODES (DTCS)

Blink Codes		DTC Description	Internal Code (HEX)	Possible Causes / Repair Information	J1587 (SID/FMI)
1st Digit	2nd Digit				
1	1	No DTCs		<ul style="list-style-type: none"> <li>The Bendix® TABS-6™ Advanced Multi-Channel (MC) module system is fully operational – no Diagnostic Trouble Codes (DTC) are detected.</li> </ul>	000/00
<b>Wheel Speed Sensors (WSS); “S-C”, “S-D”, “S-E”, “S-F”</b>					
2	1	Large Air Gap: Sensor “S-C”	0x002A00	Dynamic WSS DTC – large air gap between sensor and tone ring. <i>Go to Section E on page 47.</i>	001/00
3	1	Large Air Gap: Sensor “S-D”	0x002B00		002/00
4	1	Large Air Gap: Sensor “S-E”	0x002C00		003/00
5	1	Large Air Gap: Sensor “S-F”	0x002D00		004/00
2	2	Shorted or open wire: Sensor “S-C”	0x002400		Static WSS DTC – shorted or open sensor wire. <i>Go to Section E on page 47.</i>
3	2	Shorted or open wire: Sensor “S-D”	0x002500	002/03 002/04	
4	2	Shorted or open wire: Sensor “S-E”	0x002600	003/03 003/04	
5	2	Shorted or open wire: Sensor “S-F”	0x002700	004/03 004/04	
2	3	Dynamic Issue: Sensor “S-C”	0x001800 0x001E00 0x003000	Dynamic WSS DTC – incorrect wheel speed signal detected while vehicle is in motion. <i>Go to Section E on page 47.</i>	
3	3	Dynamic Issue: Sensor “S-D”	0x001900 0x001F00 0x003100		002/08 002/01 002/02
4	3	Dynamic Issue: Sensor “S-E”	0x001A00 0x002000 0x003200		003/08 003/01 003/02
5	3	Dynamic Issue: Sensor “S-F”	0x001B00 0x002100 0x003300		004/08 004/01 004/02
2	4	Tire Diameter Out of Range: Sensor “S-C”	0x003600		<ul style="list-style-type: none"> <li>Verify the correct tire size as desired.</li> <li>Verify the proper tire inflation.</li> <li>Verify the correct number of exciter/tone ring teeth.</li> <li>Verify that the TABS-6 Advanced MC module ECU has been programmed with the correct tire size and tone ring settings.</li> </ul>
3	4	Tire Diameter Out of Range: Sensor “S-D”	0x003700	002/13	
4	4	Tire Diameter Out of Range: Sensor “S-E”	0x003800	003/13	
5	4	Tire Diameter Out of Range: Sensor “S-F”	0x003900	004/13	

## DIAGNOSTIC TROUBLE CODES (DTCS) (CONTINUED)

Blink Codes		DTC Description	Internal Code (HEX)	Possible Causes / Repair Information	J1587 (SID/FMI)
1st Digit	2nd Digit				
<b>Trailer Power</b>					
6	1	Over-voltage	0x011F00	Power Supply DTC – trailer power above 32 volts. <i>Go to Section D on page 46.</i>	251/03
6	2	Low-voltage	0x012000	Power Supply DTC – trailer power below 8 volts. <i>Go to Section D on page 46.</i>	251/04
6	3	Excessive power line resistance	0x018500	Power Supply DTC – possible corroded or shorted trailer power circuit. <i>Go to Section D on page 46.</i>	251/13
6	3	Supply Cable Electrical Error	0x000900	<p>High resistance or a large voltage supply drop during initial chuff test after power-up.</p> <ul style="list-style-type: none"> <li>•Check that all cable interconnections are connected correctly.</li> <li>•Check there is no corrosion or contamination on the 7 pin connector at the front of the trailer.</li> <li>•Check the supply voltage across pins 1 and 7 on the 7 pin connector at the front of the trailer is within the range 8 to 32V under load.</li> <li>•Check whether any of the pins on the 5 pin power connector have been pushed back.</li> <li>•Check the supply voltage across pins B and E across the 5 pin power connector is within the range 8 to 32V under load. <i>Please reference Technical Bulletin TCH-013-032 for more details.</i></li> </ul> <p>After checking all of the above and all are found to be satisfactory, before replacing the TABS module, please contact your local Bendix representative. If the TABS module is to be changed, first save the configuration file (Configuration file -*.dvp. If it is not possible to download the system parameters, please contact your local Bendix representative.</p>	251/13

## DIAGNOSTIC TROUBLE CODES (DTCS) (CONTINUED)

Blink Codes		DTC Description	Internal Code (HEX)	Possible Causes / Repair Information	J1587 (SID/FMI)
1st Digit	2nd Digit				
<b>Pressure Sensors (Internal): "P4," "P42," and "P21," "P22," and "P1"</b>					
7	1	Internal Pressure Sensor Range: Control Port "P4"	0x00EE00	<ul style="list-style-type: none"> <li>• Verify the trailer's control (service) pressure is &lt; 130 psi.</li> <li>• After repairs – or if no issues are found – clear the Diagnostic Trouble Code (DTC).</li> <li>• If the DTC persists, contact your local Bendix representative before replacing the Bendix® TABS-6™ Advanced Multi-Channel (MC) module.</li> </ul>	077/12
7	2	Internal Pressure Sensor Range: Load Port "P42"	0x00F000	<ul style="list-style-type: none"> <li>• See the suspension manufacturer's specifications for load versus pressure. Verify that the trailer's air suspension pressure is &lt;130 psi and is within the allowable range for the specific suspension/airbag combination. [Below 50% of airbag pressure at the unladen weight, or above 50% of airbag pressure at GVWR for axles.]</li> <li>• After repairs – or if no issues are found – clear the DTC.</li> <li>• If the DTC persists, contact your local Bendix representative before replacing the Bendix TABS-6 Advanced MC module.</li> </ul>	069/12
7	3	Internal Pressure Sensor Range: Delivery Port "P21"	0x00F200	<ul style="list-style-type: none"> <li>• Perform a Pressure Component Test using the Bendix® ACom® PRO™ diagnostic software.</li> </ul>	059/12
7	4	Internal Pressure Sensor Range: Delivery Port "P22"	0x00F400	<ul style="list-style-type: none"> <li>• Verify the trailer's control (service) and brake delivery pressures are comparable and &lt;130 psi.</li> <li>• After repairs – or if no issues are found – clear the DTC.</li> <li>• If the DTC persists, contact your local Bendix representative before replacing the TABS-6 Advanced MC module.</li> </ul>	062/12
7	5	Internal Pressure Sensor Range: Supply Port "P1"	0x00EC00	<ul style="list-style-type: none"> <li>• Verify the trailer's service reservoir pressure is &lt;123 psi (8.5 bar).</li> <li>• After repairs – or if no issues are found – clear the DTC.</li> <li>• If the DTC persists, contact your local Bendix representative before replacing the TABS-6 Advanced Multi-Channel (MC) module.</li> </ul>	151/12

## DIAGNOSTIC TROUBLE CODES (DTCS) (CONTINUED)

Blink Codes		DTC Description	Internal Code (HEX)	Possible Causes / Repair Information	J1587 (SID/FMI)
1st Digit	2nd Digit				
<b>Lateral Acceleration Sensor</b>					
8	1	Lateral Acceleration Sensor – Signal Mounting Error	0x014D00	<ul style="list-style-type: none"> <li>• Before troubleshooting, verify that the trailer has been parked on level ground.</li> <li>• Verify that the Bendix® TABS-6™ Advanced MC ECU has been programmed with the proper ECU orientation, tire size, and tone ring settings.</li> <li>• Verify that the TABS-6 Advanced MC module has been mounted as per the Installation Guidelines:                             <ul style="list-style-type: none"> <li>• The configured ECU orientation matches the actual ECU orientation.</li> <li>• Verify that all Wheel Speed Sensors (WSS) are installed correctly (correct axle/left/right) (See Figure 19).</li> </ul> </li> <li>• After repairs, or if no issues are found, then clear the Diagnostic Trouble Code (DTC).</li> <li>• If the DTC persists, contact your local Bendix representative before replacing the TABS-6 Advanced MC module.</li> </ul>	099/14
8	3	Internal Lateral Acceleration Sensor – Offset Error	0x014E00	<ul style="list-style-type: none"> <li>• Before troubleshooting, verify that the trailer has been parked on level ground.</li> <li>• Verify that the TABS-6 Advanced MC module has been mounted as per the Installation Guidelines.</li> <li>• Perform a Lateral Acceleration Sensor (installation angle) Component Test using the Bendix® ACom® PRO™ diagnostic software.                             <ul style="list-style-type: none"> <li>• Verify the roll angle of the TABS-6 Advanced MC module is within <math>\pm 5^\circ</math> as measured from a flat horizontal plane.</li> <li>• If the roll angle is out of tolerance, clear the DTC and test drive the vehicle.</li> </ul> </li> <li>• After repairs, or if no issues are found, clear the DTC.</li> <li>• If the DTC persists, contact your local Bendix representative before replacing the TABS-6 Advanced MC module.</li> </ul>	099/14

## DIAGNOSTIC TROUBLE CODES (DTCS) (CONTINUED)

Blink Codes		DTC Description	Internal Code (HEX)	Possible Causes / Repair Information	J1587 (SID/FMI)
1st Digit	2nd Digit				
<b>Lateral Acceleration Sensor (continued)</b>					
8	4	Lateral Acceleration Sensor – Sensor Signal Not Found	0x015000	<ul style="list-style-type: none"> <li>• Verify that the Bendix® TABS-6™ Advanced MC module has been mounted as per the Installation Guidelines:                             <ul style="list-style-type: none"> <li>• TABS-6 Advanced MC module mounted either in 0° or 180° orientation.</li> </ul> </li> <li>• If the ECU has been configured for an external lateral acceleration sensor:                             <ul style="list-style-type: none"> <li>• Check for corroded/damaged wiring or connectors between the ECU and the external lateral acceleration sensor.</li> <li>• Verify correct wiring between the ECU and the external lateral acceleration sensor.</li> </ul> </li> </ul>	099/14
8	5	External Lateral Acceleration Sensor – Signal Not Available	0x01B000	<ul style="list-style-type: none"> <li>• Check for corroded/damaged wiring or connectors between the ECU and the external lateral acceleration sensor.</li> <li>• Verify correct wiring between the ECU and the external lateral acceleration sensor.</li> <li>• After repairs, or if no issues are found, clear the Diagnostic Trouble Code (DTC).</li> <li>• If the DTC persists, contact your local Bendix representative before replacing the TABS-6 Advanced MC module.</li> </ul>	099/14

## DIAGNOSTIC TROUBLE CODES (DTCS) (CONTINUED)

Blink Codes		DTC Description	Internal Code (HEX)	Possible Causes / Repair Information	J1587 (SID/FMI)
1st Digit	2nd Digit				
<b>Trailer System Braking</b>					
9	1	Valve Plausibility Error – Extended Brake Application	0x012D00	<ul style="list-style-type: none"> <li>• Verify that there is no residual pressure in the trailer's control (service) line.</li> <li>• After repairs, or if no issues are found, clear the Diagnostic Trouble Code (DTC).</li> <li>• If the DTC persists, contact your local Bendix representative before replacing the Bendix® TABS-6™ Advanced Multi-Channel (MC) module.</li> </ul>	057/07
9	2	Antilock Braking System (ABS) Plausibility Error – Excessive ABS Activity	0x018E00	<ul style="list-style-type: none"> <li>• Check for corroded/damaged wiring or connectors between the ECU and the Wheel Speed Sensor (WSS).</li> <li>• Check the air gap between the sensor and tone ring, pushing-in sensor(s) if needed.</li> <li>• Rotate the wheel and verify a min. of 0.25 VAC sensor output @ ~ 0.5 RPS.</li> <li>• Verify the condition of the sensor head.</li> <li>• Verify the condition and retention power of the clamping sleeve.</li> <li>• Verify the proper mounting of the exciter ring and condition of the teeth.</li> <li>• Check the wheel bearings for correct adjustment.</li> <li>• Verify the sensor wire routing and clamping.</li> <li>• After repairs, or if no issues are found, clear the DTC.</li> <li>• If the DTC persists, contact your local Bendix representative before replacing the TABS-6 Advanced MC module.</li> </ul>	057/07
9	3	Bendix® Trailer Roll Stability Program (TRSP®) Plausibility Error – Excessive TRSP Activity	0x015100	<ul style="list-style-type: none"> <li>• Clear the DTC.</li> <li>• If the DTC persists, contact your local Bendix representative before replacing the TABS-6 Advanced MC module.</li> </ul>	057/07

## DIAGNOSTIC TROUBLE CODES (DTCS) (CONTINUED)

Blink Codes		DTC Description	Internal Code (HEX)	Possible Causes / Repair Information	J1587 (SID/FMI)
1st Digit	2nd Digit				
<b>Trailer System Braking (continued)</b>					
10	1	Bendix® TABS-6™ Advanced Multi-Channel (MC) Internal Error	Use a diagnostic tool to verify specific Internal Code (HEX)	<ul style="list-style-type: none"> <li>• Check for damaged or corroded connectors.</li> <li>• Check for damaged wiring.</li> <li>• After repairs – or if no issues are found – clear the Diagnostic Trouble Code (DTC).</li> <li>• If the diagnostic code persists, contact your local Bendix representative before replacing the TABS-6 Advanced MC module.</li> </ul>	254/12
10	2	TABS-6 Advanced MC Configuration Error	Use a diagnostic tool to verify specific Internal Code (HEX)	<ul style="list-style-type: none"> <li>• Verify the ECU parameters and actual system installation are compatible using the Bendix® ACom® PRO™ diagnostic software.</li> <li>• Re-program the ECU as necessary.</li> <li>• If necessary, contact your local Bendix representative to obtain the correct configuration data.</li> </ul>	254/13
10	3	TABS-6 Advanced MC EEPROM Error	0x018A00 0x018F00	<ul style="list-style-type: none"> <li>• Verify the ECU parameters and actual system installation are compatible using the Bendix® ACom® PRO™ diagnostic software.</li> <li>• Re-program the ECU as necessary.</li> <li>• If necessary, contact your local Bendix representative to obtain the correct configuration data.</li> </ul>	254/13
10	4	TABS-6 Advanced MC Not Configured	0x019900	<ul style="list-style-type: none"> <li>• Re-program the ECU to be compatible to the actual system configuration using the ACom PRO diagnostic software.</li> <li>• If necessary, contact your local Bendix representative to obtain the correct configuration data.</li> </ul>	254/13
10	5	TABS-6 Advanced MC EOL Test Not Completed	0x019A00	<ul style="list-style-type: none"> <li>• Perform the Installation Test using the ACom PRO diagnostic software, or Bendix® Trailer Information Module (TIM).</li> </ul>	254/14

## DIAGNOSTIC TROUBLE CODES (DTCS) (CONTINUED)

Blink Codes		DTC Description	Internal Code (HEX)	Possible Causes / Repair Information	J1587 (SID/FMI)
1st Digit	2nd Digit				
<b>Auxiliary Design Language (ADL) and Auxiliary I/Os</b>					
11	1	Auxiliary I/O Error – AUX WL (#7)	0x01AF00	<ul style="list-style-type: none"> <li>• Check for corroded/damaged wiring or connectors between the ECU and Antilock Braking System (ABS) Indicator Lamp.</li> <li>• Check pin X1-5 of the ECU 'Power' connector for the following:                             <ul style="list-style-type: none"> <li>• Pin not pushed back.</li> <li>• Correctly wired to the ABS Indicator Lamp (Pin X1-5 – supply)</li> <li>• Shorted to ground, V<sub>bat</sub> or other ECU pins.</li> </ul> </li> <li>• Verify the ABS Indicator Lamp is properly grounded and not burnt out.</li> <li>• After repairs – or if no issues are found – clear the Diagnostic Trouble Code (DTC).</li> <li>• If the DTC persists, contact your local Bendix representative before replacing the Bendix® TABS-6™ Advanced Multi-Channel (MC) module.</li> </ul>	152/12
11	2	Auxiliary I/O Error – AUX I/O #1	0x006300	<ul style="list-style-type: none"> <li>• Check for corroded/damaged wiring or connectors between the ECU and the auxiliary device.</li> <li>• Check Pins X2-1 and X2-11 of the ECU 'In-Out' (I/O) connector for the following:                             <ul style="list-style-type: none"> <li>• Pins not pushed back.</li> <li>• Correctly wired to the auxiliary device (Pin X2-1 – supply, pin X2-11 – ground)</li> <li>• Shorted to ground, V<sub>bat</sub> or other ECU pins.</li> </ul> </li> <li>• Verify the auxiliary device is properly functioning and rated for maximum load of ≤ 2 amps.</li> <li>• After repairs – or if no issues are found – clear the DTC.</li> <li>• If the DTC persists, contact your local Bendix representative before replacing the Bendix TABS-6 Advanced MC module.</li> </ul>	152/12

## DIAGNOSTIC TROUBLE CODES (DTCS) (CONTINUED)

Blink Codes		DTC Description	Internal Code (HEX)	Possible Causes / Repair Information	J1587 (SID/FMI)
1st Digit	2nd Digit				
<b>Auxiliary Design Language (ADL) and Auxiliary I/Os (continued)</b>					
11	3	Auxiliary I/O Error – AUX I/O #2	0x006B00	<ul style="list-style-type: none"> <li>• Check for corroded/damaged wiring or connectors between the ECU and the auxiliary device.</li> <li>• Check Pins X2-2 and X2-11 of the ECU 'In-Out' connector for the following: <ul style="list-style-type: none"> <li>• Pins not pushed back.</li> <li>• Correctly wired to the auxiliary device (Pin X2-2 – supply, Pin X2-11 – ground)</li> <li>• Shorted to ground, V<sub>bat</sub> or other ECU pins.</li> </ul> </li> <li>• Verify the auxiliary device is properly functioning and rated for maximum load of ≤ 2 amps.</li> <li>• After repairs, or if no issues are found, clear the Diagnostic Trouble Code (DTC).</li> <li>• If the DTC persists, contact your local Bendix representative before replacing the Bendix® TABS-6™ Advanced Multi-Channel (MC) module.</li> </ul>	152/12
11	4	Auxiliary Electrical Error #4	0x01BA00	<ul style="list-style-type: none"> <li>• Clear the DTC.</li> <li>• If the DTC persists, contact your local Bendix representative before replacing the TABS-6. Advanced MC module.</li> </ul>	152/12
11	6	Auxiliary I/O Error – AUX I/O #3	0x007300	<ul style="list-style-type: none"> <li>• Check for corroded/damaged wiring or connectors between the ECU and the auxiliary device.</li> <li>• Check Pins X2-3 and X2-12 of the ECU 'In-Out' connector for the following: <ul style="list-style-type: none"> <li>• Pins not pushed back.</li> <li>• Correctly wired to the auxiliary device (Pin X2-3 – supply, pin X2-12 – ground)</li> <li>• Shorted to ground, V<sub>bat</sub> or other ECU pins.</li> </ul> </li> <li>• Verify the auxiliary device is properly functioning and rated for maximum load of ≤ 1.5 amps.</li> <li>• After repairs – or if no issues are found – clear the DTC.</li> <li>• If the DTC persists, contact your local Bendix representative before replacing the TABS-6 Advanced MC module.</li> </ul>	152/12
11	9	Auxiliary Program Error – Auxiliary Design Language (ADL)	0x017E00 0x017F00	<ul style="list-style-type: none"> <li>• Verify that the Auxiliary I/O ECU pin-outs match the ADL parameters using the Bendix® ACom® PRO™ diagnostic software.</li> <li>• If necessary, contact your local Bendix representative to troubleshoot the ADL program.</li> </ul>	152/12

## DIAGNOSTIC TROUBLE CODES (DTCS) (CONTINUED)

Blink Codes		DTC Description	Internal Code (HEX)	Possible Causes / Repair Information	J1587 (SID/FMI)
1st Digit	2nd Digit				
<b>Auxiliary Design Language (ADL) and Auxiliary I/Os (continued)</b>					
11	10	Low Supply Pressure	0x01A900 0x01AD00 0x01CD00	<ul style="list-style-type: none"> <li>• Check if the trailer's service reservoir pressure is &lt; 75 psi (5.2 bar).</li> <li>• If the trailer's service reservoir pressure is &gt; 75 psi (5.2 bar):                             <ul style="list-style-type: none"> <li>• Cycle Ignition power "OFF" and "ON".</li> </ul> </li> <li>• If the Diagnostic Trouble Code (DTC) persists, contact your local Bendix representative before replacing the Bendix® TABS-6™ Advanced Multi-Channel (MC) module.</li> </ul>	152/01 254/11 254/01
11	11	WL (Indicator Lamp) Information – Auxiliary Design Language (ADL)	0x017C00 0x017D00	<ul style="list-style-type: none"> <li>• Verify that the ADL parameters are correct using the Bendix® ACom® PRO™ diagnostic software.</li> <li>• If necessary, contact your local Bendix representative to troubleshoot the ADL program.</li> </ul>	152/14
<b>Miscellaneous</b>					
12	1	Service Distance or Date Exceeded	0x019500 0x019700	<ul style="list-style-type: none"> <li>• Perform scheduled trailer maintenance and/or reset the Service Distance or Date.</li> <li>• Perform the Installation Test using the ACom PRO diagnostic software, or Bendix® Trailer Information Module.</li> </ul>	153/00
12	2	Trailer Load Out of Range	0x012700	<ul style="list-style-type: none"> <li>• If trailer is equipped with a raise/lower valve, verify it is in the drive position.</li> <li>• Verify that the ECU parameters for the empty and fully loaded trailer conditions are correct using the ACom PRO diagnostic software, or Bendix Trailer Information Module.</li> <li>• If necessary, contact your local Bendix representative to troubleshoot the trailer's loading condition.</li> </ul>	069/13
12	3	Brake Pads Worn	0x017B00	<ul style="list-style-type: none"> <li>• Manually check the condition of the pads on each brake to determine if any require replacement.</li> <li>• If no pads require replacement, check the wear sensors and cables for damage or defects.</li> </ul>	070/01
12	4	Low System Pressure, P1	0x012400 0x012500	<ul style="list-style-type: none"> <li>• Check if the trailer's service reservoir pressure is &lt; 65 psi (4.5 bar).</li> <li>• If the trailer's service reservoir pressure is &gt; 65 psi (4.5 bar):                             <ul style="list-style-type: none"> <li>• Cycle Ignition power "OFF" and "ON".</li> </ul> </li> <li>• If the DTC persists, contact your local Bendix representative before replacing the TABS-6 Advanced MC module.</li> </ul> <p>Note: 12400 is for low pressure when stationary, 12500 is for low pressure when moving</p>	254/11

## DIAGNOSTIC TROUBLE CODES (DTCS) (CONTINUED)

Blink Codes		DTC Description	Internal Code (HEX)	Possible Causes / Repair Information	J1587 (SID/FMI)
1st Digit	2nd Digit				
<b>Miscellaneous (continued)</b>					
12A66: G66	4	System Pressure Too High	0x004800	<ul style="list-style-type: none"> <li>• Check system pressure P1 in the Bendix® ACom® PRO™ diagnostic software pressures menu.</li> <li>• If using shop air for trailer pressure supply, please verify that the shop pressure is below 138 PSI.</li> <li>• If the error is still present, before replacing the Bendix® TABS-6™ Advanced Multi-Channel (MC) module, please contact your local Bendix representative.</li> <li>• If the TABS-6 Advanced MC module is to be changed, first save the configuration file (Configuration file -*.dpv). If it is not possible to download the system parameters, please contact your local Bendix representative.</li> </ul>	254/11
12	8	Bendix® Trailer Information Module (TIM) Missing	0X01AA00	<ul style="list-style-type: none"> <li>• Trailer Information Module and/or harness damaged or not present.</li> </ul>	254/11
<b>Mechanical Load Sensor</b>					
13	4	Load Sensor Error	0X01C200	<ul style="list-style-type: none"> <li>• (Spring Suspension Systems) Inspect the linkage: Check that the linkage is attached to the axle, inspect for damage to the linkage components, loose connectors, and incorrect installation.</li> <li>• If the Diagnostic Trouble Code (DTC) persists, contact your local Bendix representative before replacing the TABS-6 Advanced MC module.</li> </ul>	69/13

## 23. TROUBLESHOOTING

### Using Hand-Held or Bendix® ACom® PRO™ Diagnostic Software

Troubleshooting and Diagnostic Trouble Code (DTC) clearing, as well as beginning a re-configuration, may also be carried out using hand-held or PC-based diagnostic tools such as the Bendix® Trailer Remote Diagnostic Unit (TRDU™), the ACom PRO diagnostic software, or the Bendix® Trailer Information Module.

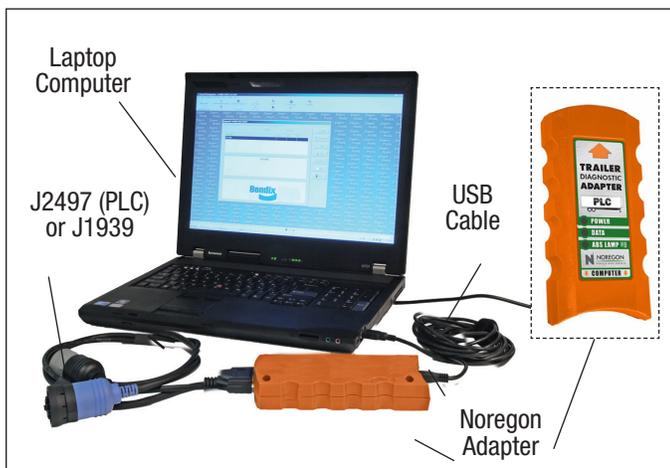
### BENDIX ANTILOCK BRAKING SYSTEM (ABS) DIAGNOSTIC TOOLS

#### ACom PRO Diagnostic Software

ACom PRO diagnostic software is an RP-1210-compliant PC-based diagnostic software program that provides the highest level of diagnostic support for the Bendix® TABS-6™ Advanced Multi-Channel (MC) module. With Bendix ACom PRO diagnostic software, maintenance personnel can:

- Obtain DTC information (both active and inactive DTCs)
- Retrieve event history
- Clear inactive DTCs and event history
- Verify ECU configuration
- Perform system and component tests
- Read/write customer information in the scratch pad
- Save and print information
- Receive troubleshooting assistance

When diagnosing the TABS-6 Advanced MC module using a PC and ACom PRO diagnostic software, the computer's USB port can be connected to the vehicle's diagnostic connector through an RP-1210-compliant communications device.



For more information on the ACom PRO diagnostic software, or RP-1210 compliant tools, contact Bendix or refer to your local authorized Bendix parts outlet.

software, or RP-1210 compliant tools, contact Bendix or refer to your local authorized Bendix parts outlet.

### TRDU Tool (K101597)



Figure 11 – TRDU Tool

The Bendix TRDU tool provides the technician with a visual indication of Antilock Braking System (ABS) component DTC information. The TRDU tool is specifically designed for use with Bendix® Trailer ABS systems and Bendix makes no claims for its operation and/or usability with other brands of trailer ABS.

#### Features of the Bendix TRDU Tool

The TRDU tool attaches to a 7-pin-to-7-pin adapter (See Figure 12) and then into the J560 connector of the towing vehicle.



Figure 12 – TRDU™ Tool and Adapter

The TRDU tool communicates across PLC.

The TRDU tool allows the technician to:

- Troubleshoot ABS system component problems using DTC reporting via LEDs.
- Reset DTCs on ABS ECUs by holding a magnet over the reset of the TRDU tool for less than six (6) seconds.

## How the Bendix® Trailer Remote Diagnostic Unit (TRDU™) Tool Operates

When the TRDU tool is plugged into the adapter – and the adapter/TRDU tool is installed between the trailer connector and the J560 connector of the towing vehicle that has the ignition on – all the LEDs will illuminate, and the green LED will flash four (4) times to indicate communications have been established.

If the Antilock Braking System (ABS) Electronic Control Unit (ECU) has no active Diagnostic Trouble Codes (DTCs), only the green LED will remain illuminated.

If the ABS ECU has at least one (1) active DTC, the TRDU tool displays the first DTC by illuminating the red LEDs, indicating the malfunctioning ABS component and its location on the vehicle. See Figure 13.

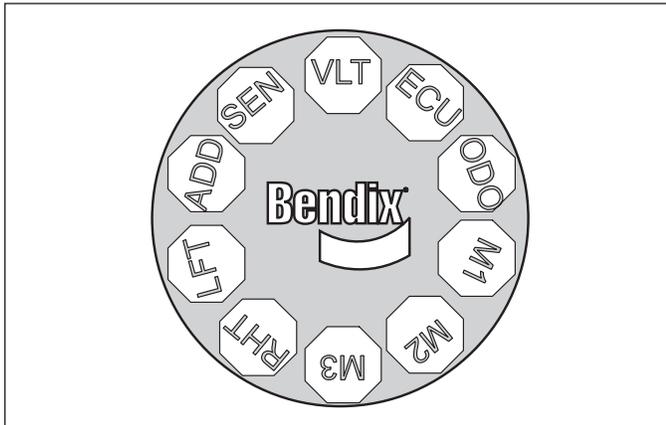


Figure 13 – The Bendix® TRDU™ Tool Display

LED Diagnostic Trouble Codes			
VLT -	Power	MOD3 -	Modulator 3
ECU -	ABS Controller	LFT -	Left
SEN -	Wheel Speed Sensor	RHT -	Right
MOD1 -	Modulator 1	ADD -	Additional
MOD2 -	Modulator 2	ODO -	Odometer

Example: If the DTC is "Right Additional Sensor", the TRDU™ tool will display one green and three red LEDs

LEDs  
Green  
VLT  
Blue  
ODO  
All others are Red

Figure 14 – DTCs using the TRDU Tool

If there are multiple DTCs on the ABS system, the TRDU tool will display one (1) DTC first, then once that DTC has been repaired and cleared, the next code will be displayed. The TRDU tool repeatedly blinks out the mileage stored once communications have been established. By counting the sequence of blinks and/or strobes on the blue LED, the odometer reading is given.

- VLT (Flashing indicates either an over- or under-voltage condition)

To pinpoint the root cause and to ensure the system DTC is properly corrected the first time, additional troubleshooting may be necessary.

**NOTE:** When a TRDU tool is connected to a system with a Bendix® TABS-6™ Advanced Multi-Channel (MC) module, and has established communications, the ECU will use the ABS indicator lamp to blink codes for all active DTCs.

## TRDU Tool Reset Function

The magnetic reset switch is located by the letter "B" in the Bendix logo on the top of the TRDU tool. When a magnet (with minimum of 30 gauss) is held over the switch for less than six (6) seconds, the "clear DTCs" command is sent. [If a magnet is not available, you may use a spare Wheel Speed Sensor (WSS), since its internal magnet will be sufficient.]

Additionally, it is recommended at the end of any inspection that the technician switches off and restores the power to the ABS ECU, and then re-checks the ABS indicator lamp and TRDU tool to see if they indicate any remaining DTCs.

## Bendix® Trailer Information Module

The Bendix Trailer Information Module is a display device that combines the functionality of system diagnostics with the ability to display and store other trailer-related information of value to an operator, driver, or workshop. Maximum benefit is obtained from the Trailer Information Module functionality when it is mounted on the trailer so that it is able to record events that occur during driving. Alternatively, it may also be used as a workshop tool to access diagnostic information, to check the configuration, or to run an installation test. In all cases, the Trailer Information Module is connected to the J1939 EC5V TI (CAN) connection of the auxiliary connector which supplies the necessary information.



Figure 15 – Trailer Information Module

## Additional Support at [bendix.com](http://bendix.com)

For the latest information and the Bendix® ACom® PRO™ diagnostic software, visit the Bendix website at [bendix.com](http://bendix.com).

## The Bendix Tech Team

For direct personal technical support, call the Bendix Tech Team at **1-800-AIR-BRAKE** (1-800-247-2725), Monday through Thursday, 8:00 a.m. to 6:00 p.m. ET, and Friday, 8:00 a.m. to 5:00 p.m. ET. The Tech Team is also available by email at [techteam@bendix.com](mailto:techteam@bendix.com).

Record the following information before contacting the Bendix Tech Team:

- Bendix product model number, part number, and configuration
- Vehicle make and model
- Vehicle configuration (number of axles, tire size, etc.)
- System performance symptoms: When do they occur?
- What Diagnostic Trouble Codes (DTCs) have been identified using LEDs, blink codes, or diagnostic tools?
- What troubleshooting/measurements have been performed?
- What Bendix technical documentation do you have or need?

## SERVICING THE BENDIX® TABS-6™ ADVANCED MULTI-CHANNEL (MC) MODULE

Special considerations need to be taken to ensure the TABS-6 Advanced MC module has been properly installed on the trailer.

- Location and orientation of the module
- Correct plumbing of the module
- Correct deflection sensor installation (where used)
- Correct location of the Wheel Speed Sensors (WSS)
- Configuration of the Electronic Control Unit (ECU) for the Antilock Braking System (ABS) and the Bendix® Trailer Roll Stability Program (TRSP®) system parameters
- Installation test to verify proper installation of the ABS/TRSP systems



**Incorrect installation of the TABS-6 Advanced MC module system can result in impaired ABS and TRSP system functions. It is the responsibility of the end-user to ensure the TABS-6 Advanced MC module has been installed correctly and tested as per the Bendix recommended installation guidelines and system drawings.**

Prior to performing service to the TABS-6 Advanced MC module, always perform the following steps:

1. Follow all industry safe maintenance practices including those on *page two (2) of this document*.
2. Ideally, before removing the module, use ACom PRO diagnostic software to save the configuration to the desktop. After the module has been replaced, the technician can restore the previous configuration settings.
3. Turn the power off.
4. Drain the air pressure from all reservoirs.
5. Remove as much contamination as possible prior to disconnecting electrical connections and air hoses.
6. Note the TABS-6 Advanced MC module's mounting position on the vehicle.

## Removing the TABS-6 Advanced MC Module

1. Open the end covers by sliding the locking tabs to the left. If the module is to be reinstalled, retain the covers.
2. Disconnect the 7-pin ECU connector, the 12-pin auxiliary/diagnostic harness (if present), and the 2-pin WSS connectors, depending on the configuration, and any additional harness present on connector 2.3 or 2.4.
3. Mark for reinstallation and then remove all air hoses connected to the TABS-6 Advanced MC module.
4. Remove the TABS-6 Advanced MC module from the vehicle by removing the mounting fasteners.

## Servicing the Control Port Filter

The TABS-6 Advanced Multi-Channel (MC) module has an in-line filter in the control port (See *Figure 2*). This filter should be inspected and cleaned (if any contamination is found), every four (4) months, 34,000 miles, or 1,200 operating hours. For severe applications, this inspection interval may be reduced. If the filter is found to be damaged, install a replacement. The filter should also be inspected as part of any troubleshooting where the service brakes are slow to apply and other possible causes have been ruled out.

**Installation of the Bendix® TABS-6™ Advanced Multi-Channel (MC) Module**



All service replacement parts for the TABS-6 Advanced MC module are configured specifically by part number.

As mentioned in the *Servicing the Bendix TABS-6 Advanced MC Module* section, ideally, before removing the module, use Bendix® ACom® PRO™ diagnostic software to save the configuration to the desktop. The technician can use ACom PRO diagnostics to restore the previous configuration settings.

Always verify that the correct service replacement Electronic Control Unit (ECU) is being installed for the original TABS-6 Advanced MC module. To verify proper installation, perform the installation test using the ACom PRO diagnostic software or use the Bendix® Trailer Information Module.

If replacement hardware is needed, use Class-8 steel M10 x 1.5 lock nuts and washers for frame-mounting. Inspect the location selected for installation and clean as necessary.

**NOTE:** Inspect all components, including the replacement of the TABS-6 Advanced MC module, for any external damage, such as cracked valve ports, electronic housings, etc. Any components found to be damaged should not be installed on the vehicle and must be replaced.

1. The TABS-6 Advanced MC module should be installed with the following considerations (See Figures 16 through 18):

- With the exhaust port facing downward and unobstructed with significant free space below (>1 in.).
- Within ± 100 in. (2.5 m) of the center of the axle(s) for properly balanced brake applications.
- Within ± 2 in. (5.1 cm) from the center line of the trailer (default).

**NOTE:** a left/right offset greater than ± 2 in. (5.1 cm) may have been programmed in the ECU and can be verified using the ACom PRO diagnostic software.

- The yaw angle should be ± 10° as measured from the center line of the trailer.
- The pitch angle should be ± 10° as measured from a flat horizontal plane.
- The roll angle should be within ± 5° as measured from a flat horizontal plane.

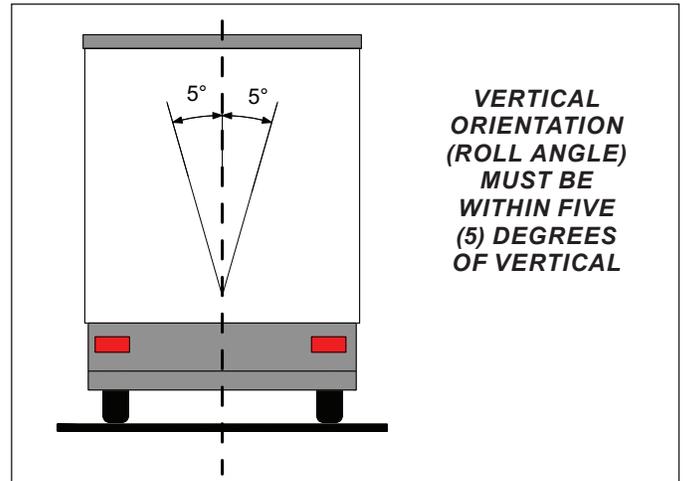


Figure 16 – Installation on the Trailer (Vertical)

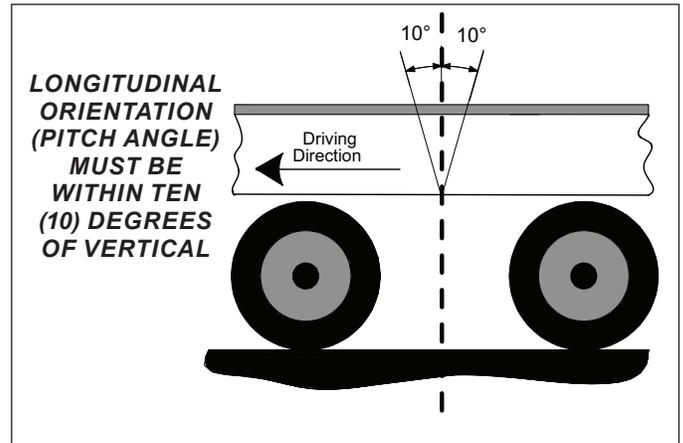


Figure 17 – Installation on the Trailer (Longitudinal)

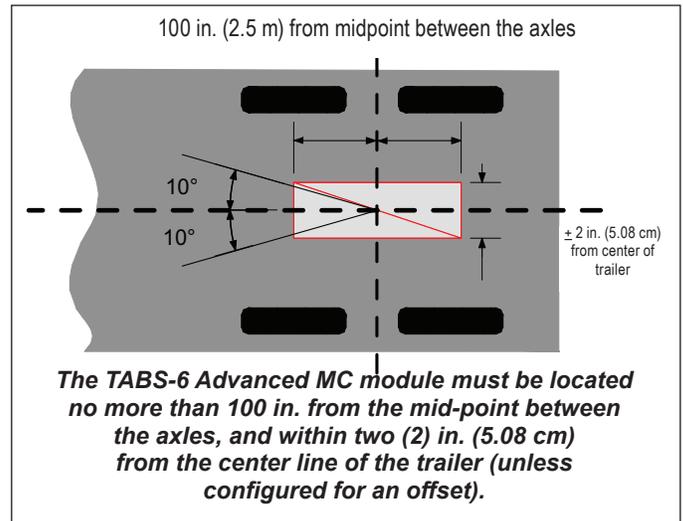
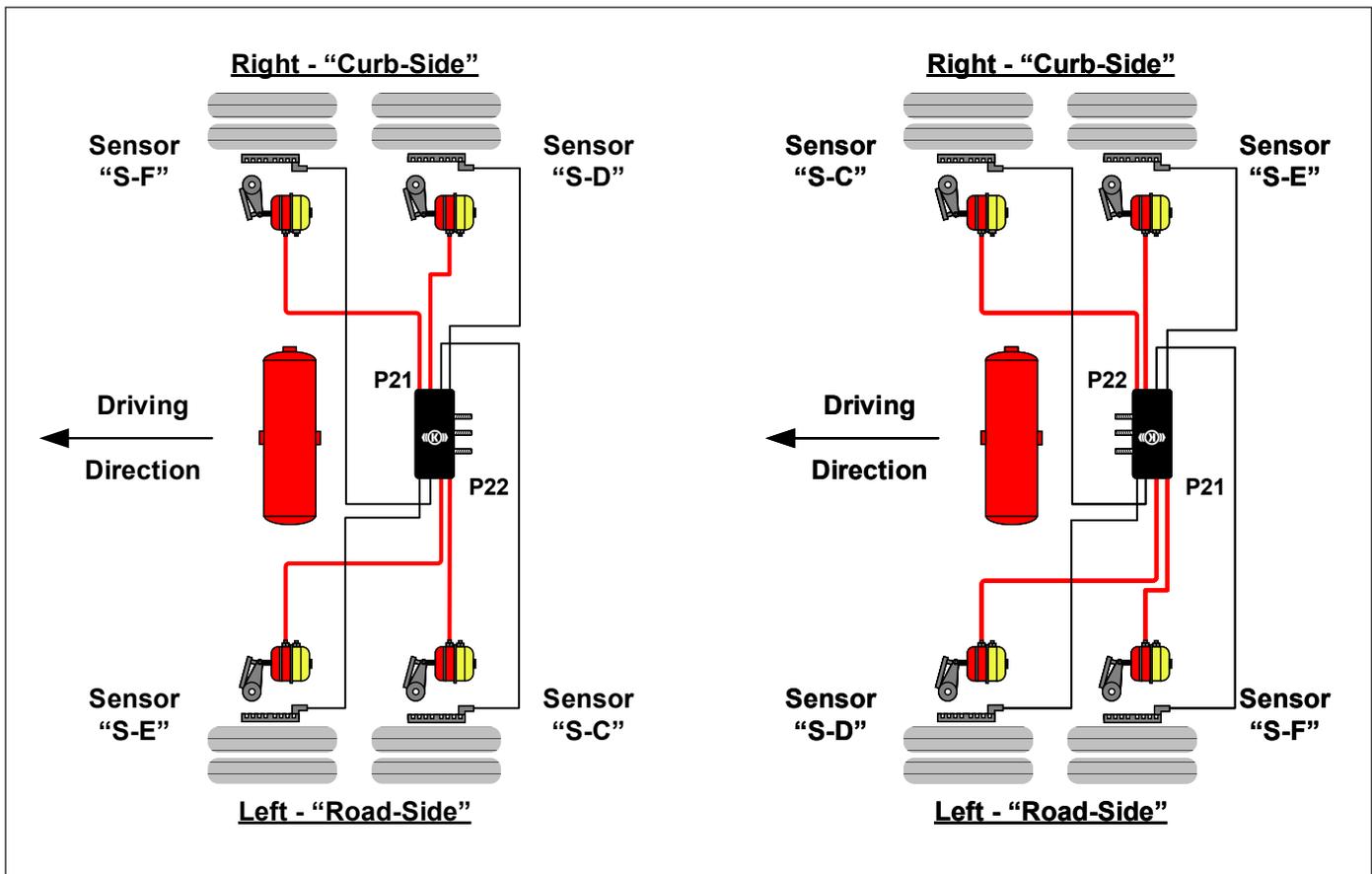


Figure 18 – Installation on the Trailer (Center Line)



**Figure 19 – Wheel Speed Sensor (WSS) Locations**

**Frame-Mount Module:** The Bendix® TABS-6™ Advanced Multi-Channel (MC) module uses three (3) Class-8 steel M10x1.5 lock nuts with washers, torqued to  $354 \pm 44.4$  in.-lbs ( $40 \pm 5$  N•m).

2. Reconnect all of the air hoses and plugs to the module. Depending on the installation, additional plugs may be necessary. Thread sealant products that contain PTFE may be used; however, thread sealant tape is not recommended as there is a potential for tape material entering the valve and affecting the valve's operation. Ensure no thread sealant enters the valve. All air hoses and fittings should be checked for leaks prior to returning the vehicle to service.
3. Reconnect the Electronic Control Unit (ECU) power, auxiliary power (if present), and WSS electrical connectors to the ECU. Apply a small amount of non-conductive electrical grease to each connector pin before reconnecting.

**NOTE:** The WSS must follow the orientation of the module as shown in *Figure 19* for fixed-axle trailers. Where a lift axle is present, and sensors are to be installed on that axle, secondary sensors "SE" and "SF" must be used for the lift axle.

- It is necessary to fix the WSS to the orientation of the lateral acceleration sensor for plausibility checks between the sensors.
  - If the WSS location does not match the orientation of the TABS-6 Advanced MC module shown in *Figure 19*, a Diagnostic Trouble Code (DTC) will be generated and the Antilock Braking System (ABS) indicator lamp will be illuminated.
  - Refer to the raised lettering on the casting body, or see *Figure 19*, for WSS locations, "S-C," "S-D," "S-E," and "S-F."
4. Leakage and operational tests must be performed before returning the vehicle to service.

## Leakage and Operational Tests



### WARNING

For NPTF fittings, the use of a thread sealant is recommended. This can be a pre-applied or a hand-applied sealant product (with PTFE). When using a hand-applied sealant, use caution so as not to over-apply. Always follow the fitting manufacturer's pre-applied or hand-applied thread sealant recommendations. Use of PTFE tape is not approved and will void the Bendix® Antilock Braking System (ABS) and the Bendix® Trailer Roll Stability Program (TRSP®) valve warranty.

1. Before performing the leakage tests, block the wheels.
2. Fully charge the ABS and verify proper brake adjustment.
3. Make several trailer brake applications and check for prompt application and release at each wheel.
4. Perform the leak-down test procedure:
  - Set up the pressure circuits to apply emergency (red) line and service pressures with a regulator and a pressure gauge on each line.
  - Apply 110 - 120 psi to the trailer emergency (red) circuit to release the parking brake.
  - Apply the service brakes at 90 - 95 psi.
  - Identify and record the pressure from the gauge on the emergency (red) line and the service line.
  - Cut off the pressure to the emergency (red) line before the pressure gauge and monitor for the pressure to drop. If the pressure drops less than 3 psi in one (1) minute, the emergency (red) line test passes. If the pressure drops more than 3 psi in one (1) minute, identify and correct the source of the leak on the emergency (red) line.
  - If the emergency (red) line test passes, repeat the test for the service line. If the pressure drops less than 2 psi in one (1) minute, the test passes. If the pressure drops more than 2 psi in one (1) minute, identify and correct the source of the leak on the service line.
  - A soap and water solution can be used to identify sources of leaks on the fittings and valves.
  - If available, a Lite-Check® machine can be used to perform the leak-down test.
5. Apply power and monitor the power-up sequence to verify proper system operation. See Section 15.
6. Calibrate and set the odometer parameters, if necessary, using a diagnostic tool. See Section 16.
7. Perform an installation test using a diagnostic tool. Minimum tests that are required to verify the proper installation of the ABS/TRSP system are:
  - **Electronic Control Unit (ECU) Information:** This test provides the user with specific ECU information. It is required that no Diagnostic Trouble Codes (DTCs) (other than "end-of-line test not completed") are present and that the ECU has been configured.
  - **Wheel End Sequence Test:** During this test, checks are carried out that verify the correlation of the wheel installed with a Wheel Speed Sensor (WSS) and the pressure modulator that controls the pressure to the associated brake.
  - **Lateral Acceleration Test:** The installation angle information is retrieved from the ECU and compared to the predefined limits ( $\pm 5$  degrees). This test verifies the unit is installed as close to horizontal as possible.
  - **Pressure Sensor Test:** During this test, checks are carried out that verify that the proper response is received from the pressure sensors during a brake application.
  - **Axle Load Sensing Test (Air Ride):** The test has the user verify the expected measurement of the load pressure sensor, Port 42, for air ride suspensions. The program provides the reading of the sensor.
  - **Mechanical Load Sensor Test (Mechanical Spring Ride):** The test has the user verify the expected measurement of the spring deflection sensor. The program provides the reading of the sensor.
  - **Customer Scratch Pad:** The tester is requested to input data into the fields displayed on the screen. This data will be stored in the ECU and also can be stored to a file on the computer or printed out for reference.
8. Where a safe location (e.g. a restricted access area or a test track) is available, it is possible to road test the ABS function by making an abrupt stop from a vehicle speed of about 20 mph (32.19 kph) to check for proper function. The wheels should not enter a prolonged lock condition and the ABS function should be audible. It is the responsibility of the technician to perform this test in a safe location.

## ANTILOCK BRAKING SYSTEM (ABS) WIRING

### WARNING

Disconnect the electrical connectors from the ABS or the Bendix® Trailer Roll Stability Program (TRSP®) controller before welding on the trailer.

### WARNING

Dielectric grease should be applied to electrical connectors to help protect against moisture intrusion.

All connector leads of the Bendix® TABS-6™ Advanced Multi-Channel (MC) module pigtail harness are weather-sealed at the connector interface and are clearly labeled for proper installation.

Bendix provides over-molded versions of the TABS-6 Advanced MC module's wiring harness and Bendix recommends that the complete harness be replaced if corrosion or damage occurs.

When troubleshooting ABS wiring, some general rules should be followed where applicable.

1. Check all wiring and connectors to ensure they are secure and free from visible damage (e.g. cuts, abrasions, etc.).
2. Check for evidence of wire chafing due to poor routing or poor securing of wires.
3. Check connectors for proper insertion and locking.
4. Verify the connector pins are properly greased with a non-conductive electrical grease compound.
5. Connector terminals must not show signs of corrosion or exposure to the environment.
6. Never pierce wire insulation when checking for continuity.
7. Do not deform individual pins or sockets during probing with a volt/ohm meter.
8. It is strongly recommended that all wiring harnesses and sensor leads are properly secured at least every 18 in. (46 cm).
9. Apply a small amount of non-conductive electrical grease to each connector pin before reconnecting.

## MISCELLANEOUS MAINTENANCE

### WARNING



#### GLAD HAND MAINTENANCE

▲ **NEVER POUR ANY LIQUIDS** (alcohol, anti-freeze, additives, etc.) into the glad hands. Liquids may cause the o-rings and seals to swell, or may result in lubrication loss and leave harmful residues.

- ▲ **Prevent nesting insects and contaminants from entering and blocking the air hoses. Check that screens are present and clean.**
- ▲ **Drain the trailer air tanks a minimum of every six (6) months.**

**Liquids/contamination can cause TRAILER AIR BRAKE FAILURE and/or the INABILITY TO RELEASE the trailer parking brakes.**

# TROUBLESHOOTING: ELECTRICAL SCHEMATICS

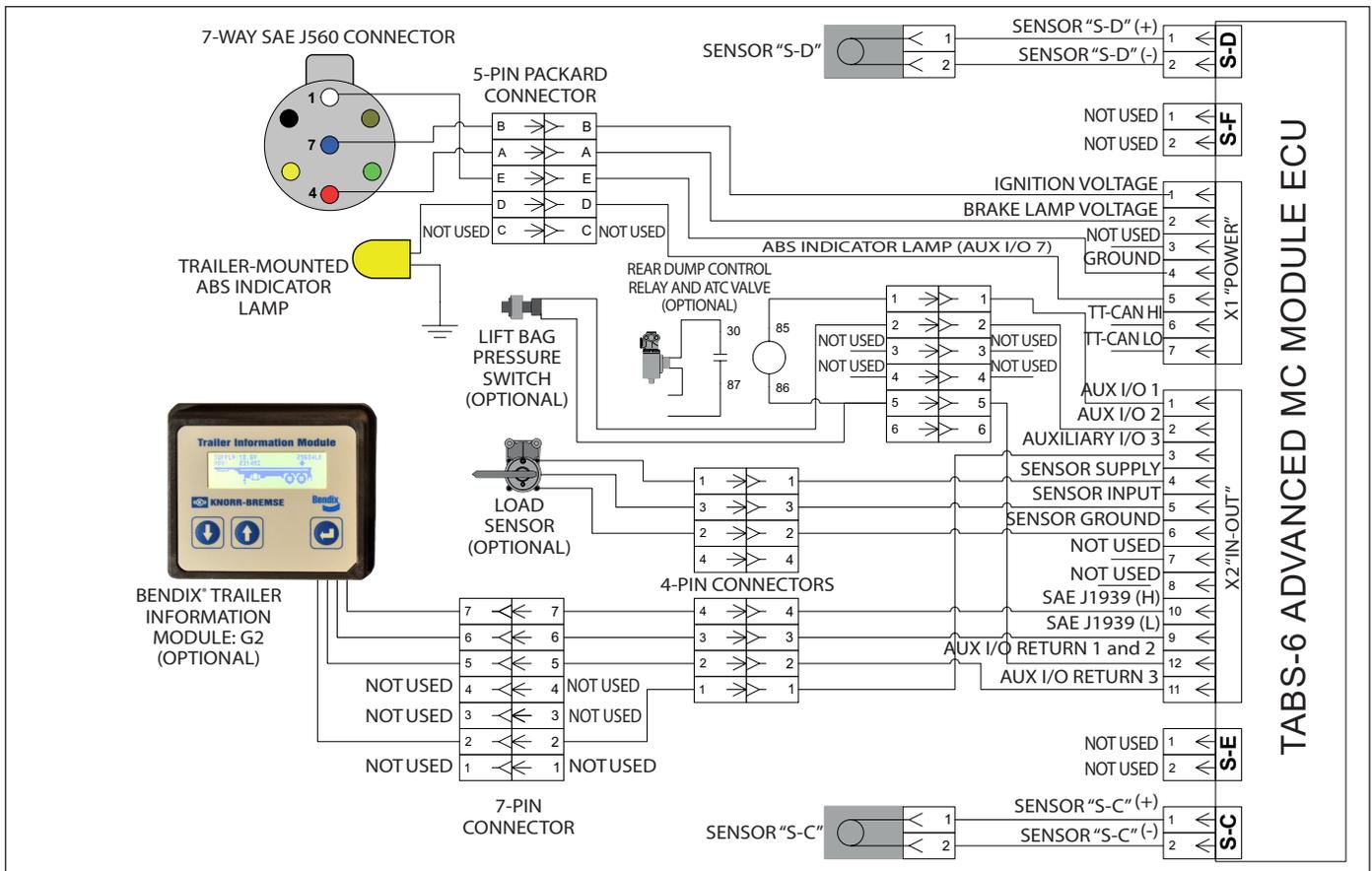


Figure 20 – Bendix® TABS-6™ Advanced Multi-Channel (MC) Module Electrical Schematic - 2S/2M

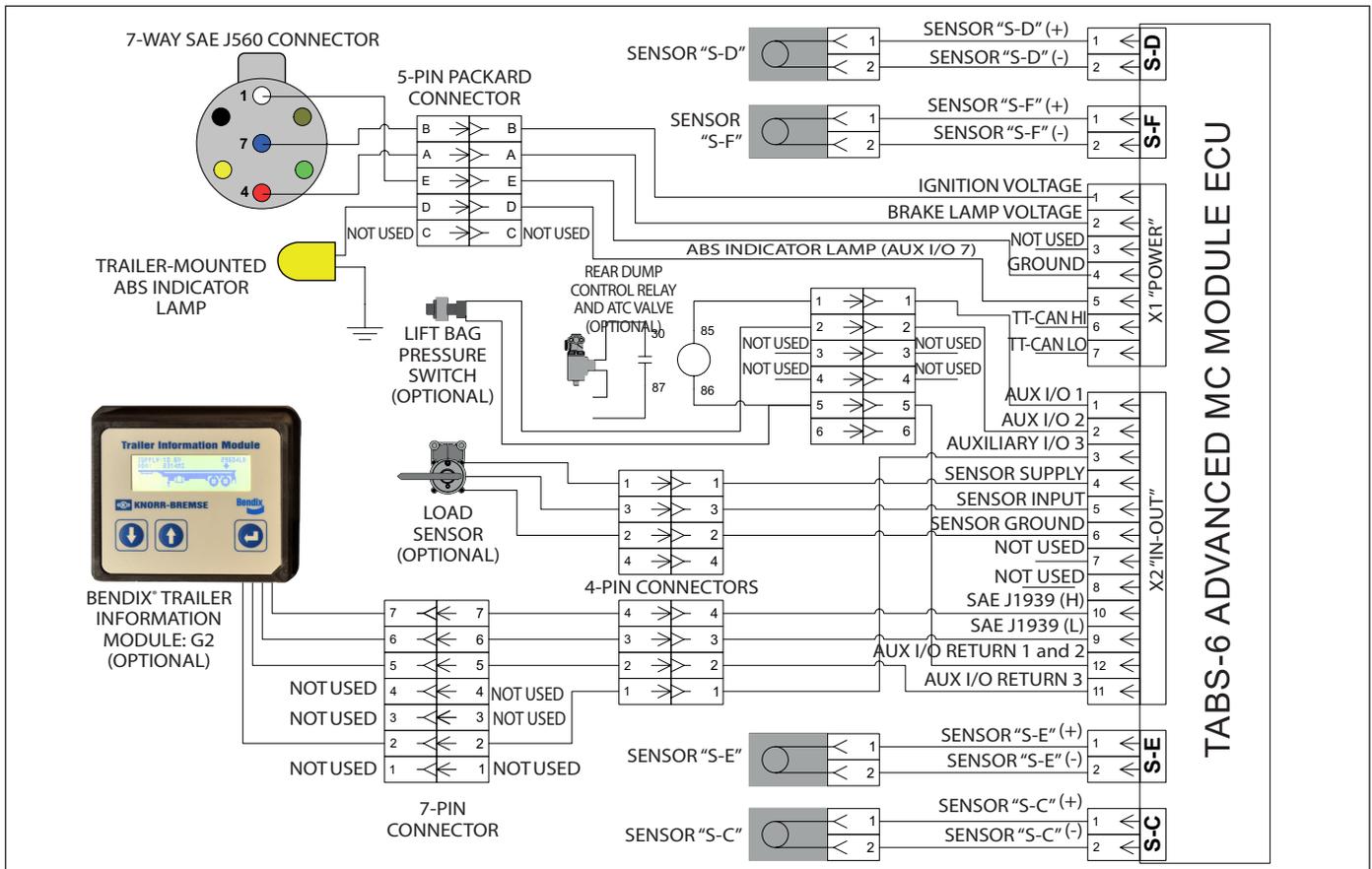
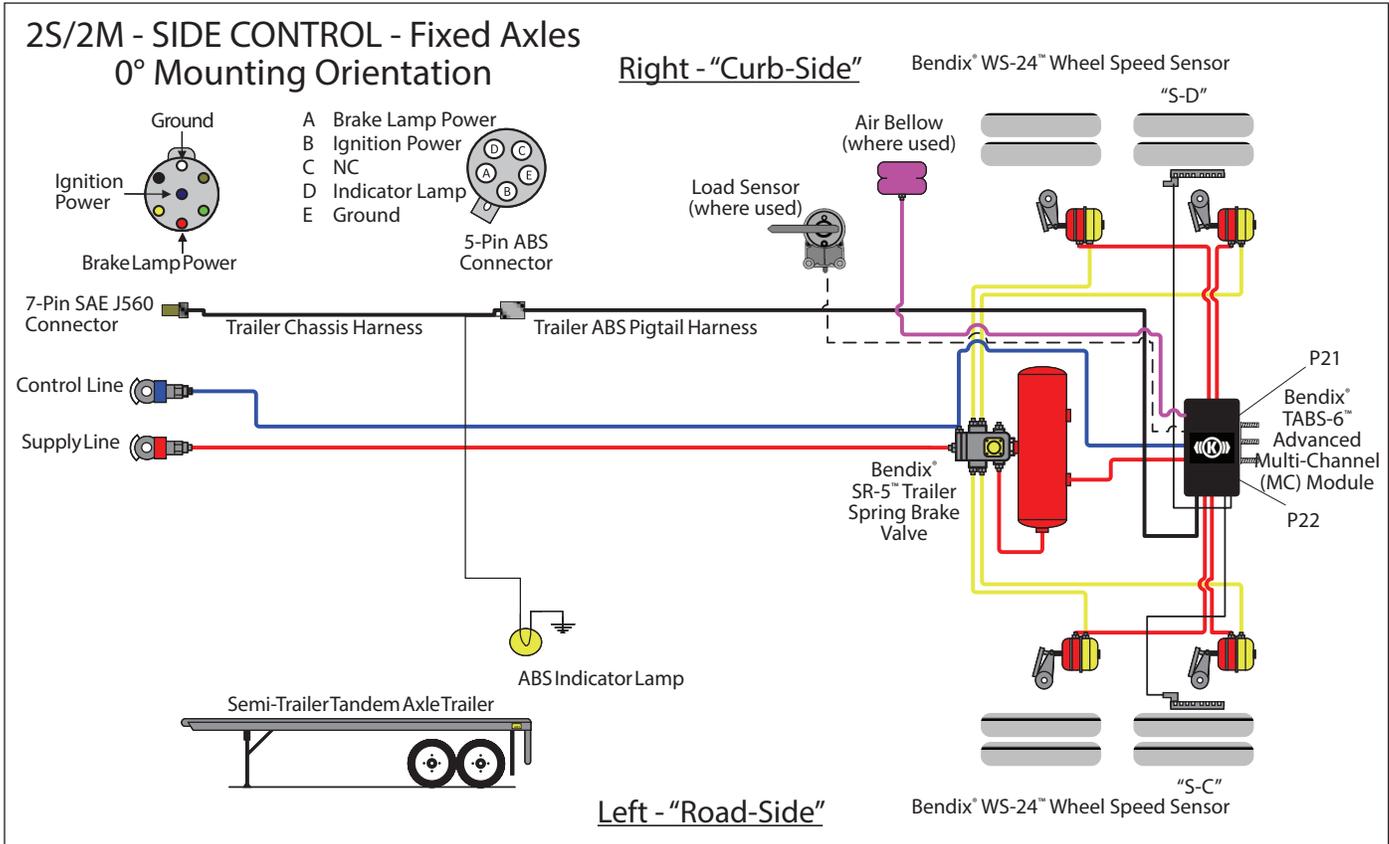
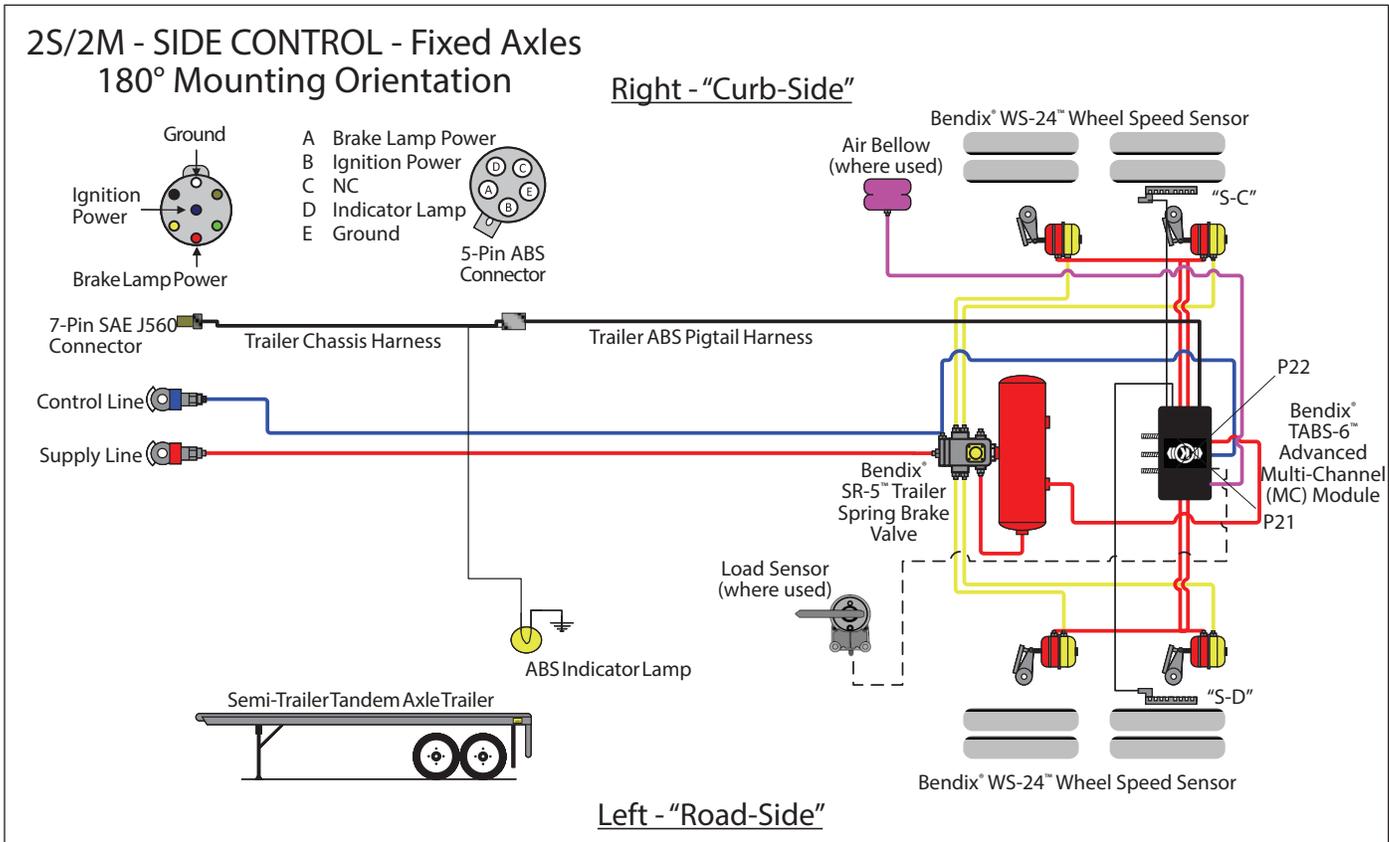


Figure 21 – Bendix TABS-6 Advanced MC Module Electrical Schematic - 4S/2M

# Troubleshooting: System Schematics

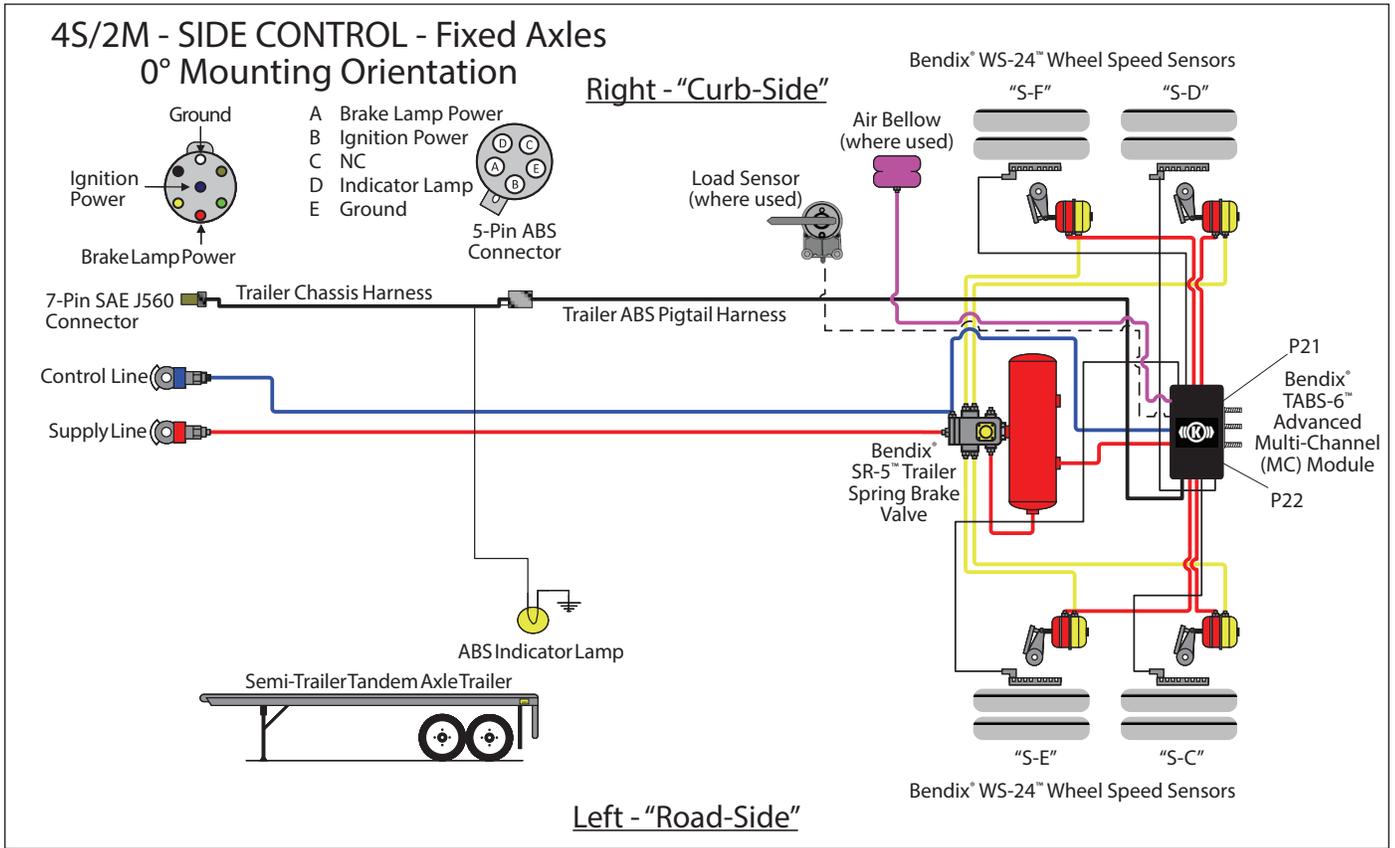


**Figure 22 – Bendix® TABS-6™ Advanced Multi-Channel (MC) Module - 2S/2M Side Control (0°) Antilock Braking System (ABS) Electrical and Air System**

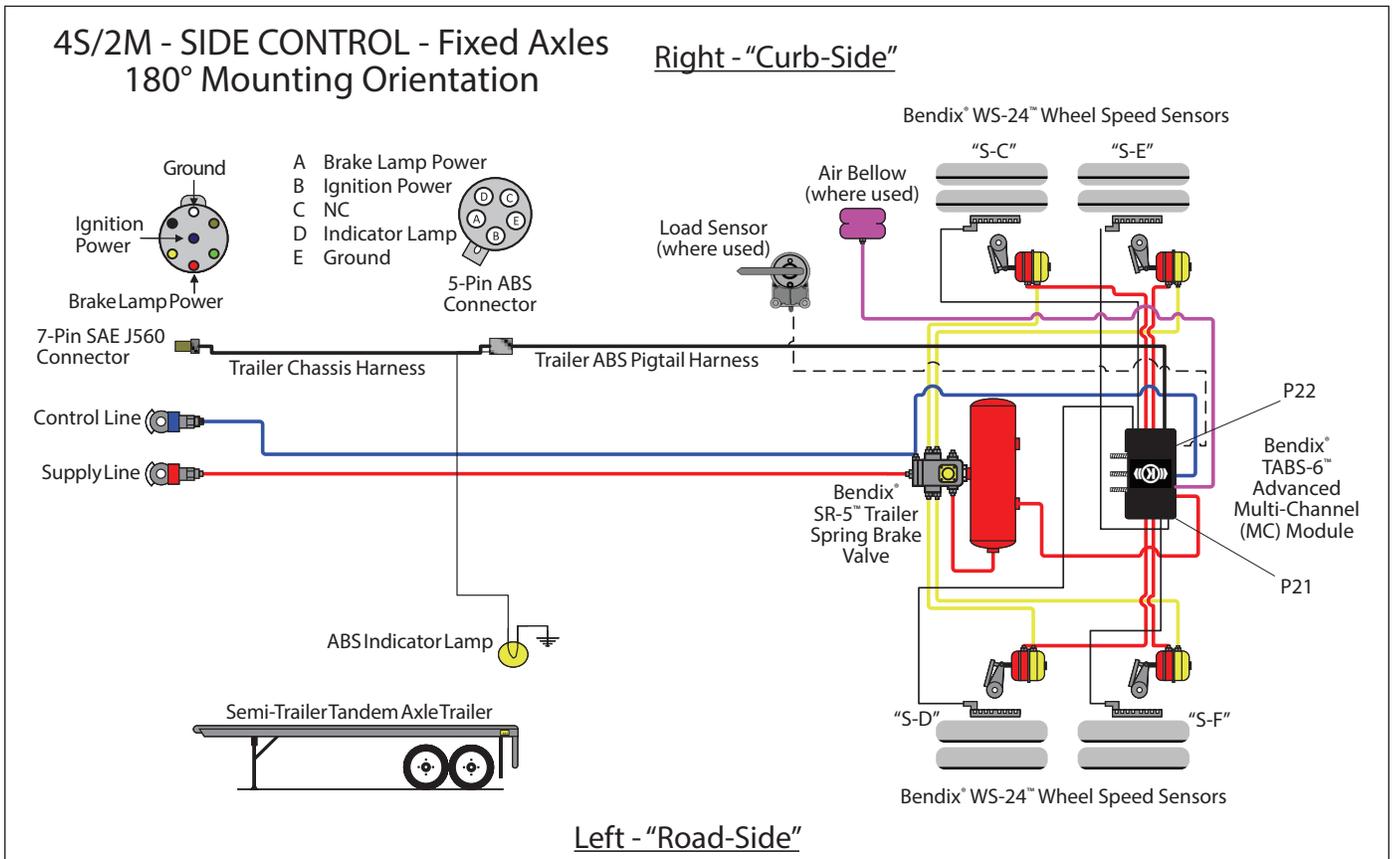


**Figure 23 – Bendix TABS-6 Advanced MC Module - 2S/2M Side Control (180°) ABS Electrical and Air System**

# Troubleshooting: System Schematics

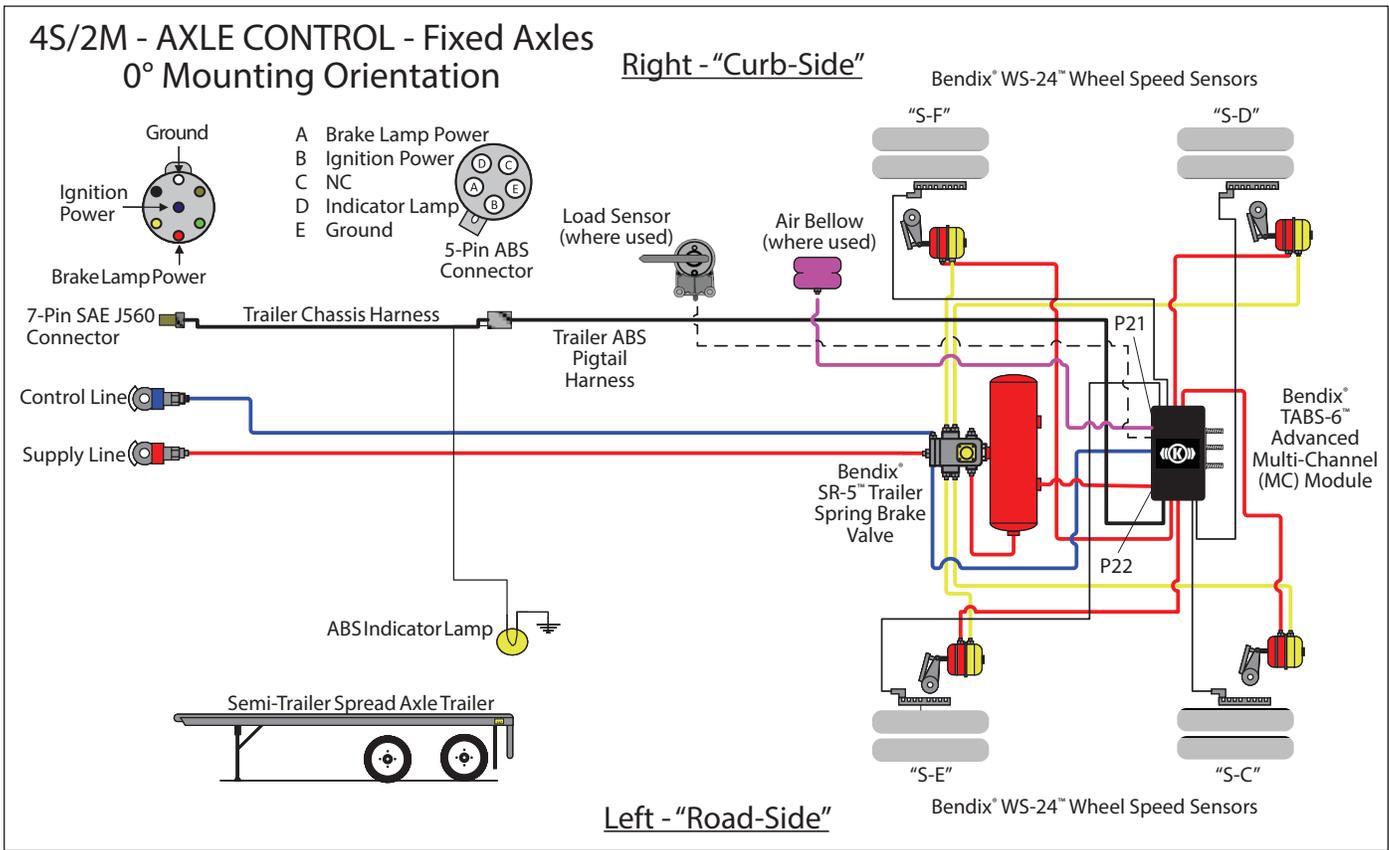


**Figure 24 – Bendix® TABS-6™ Advanced Multi-Channel (MC) Module - 4S/2M Side Control (0°) Antilock Braking System (ABS) Electrical and Air System**

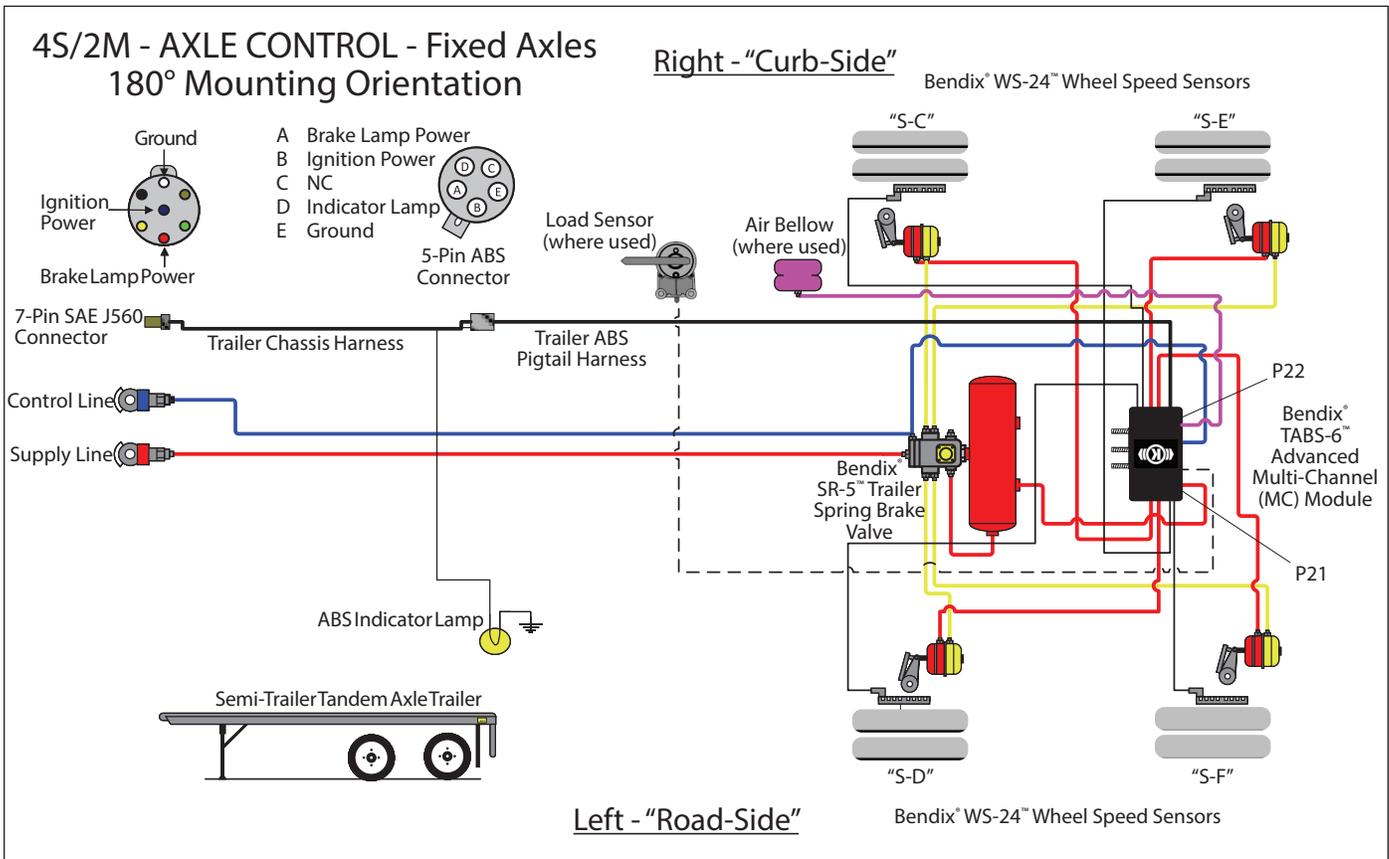


**Figure 25 – Bendix TABS-6 Advanced MC Module - 4S/2M Side Control (180°) ABS Electrical and Air System**

# Troubleshooting: System Schematics

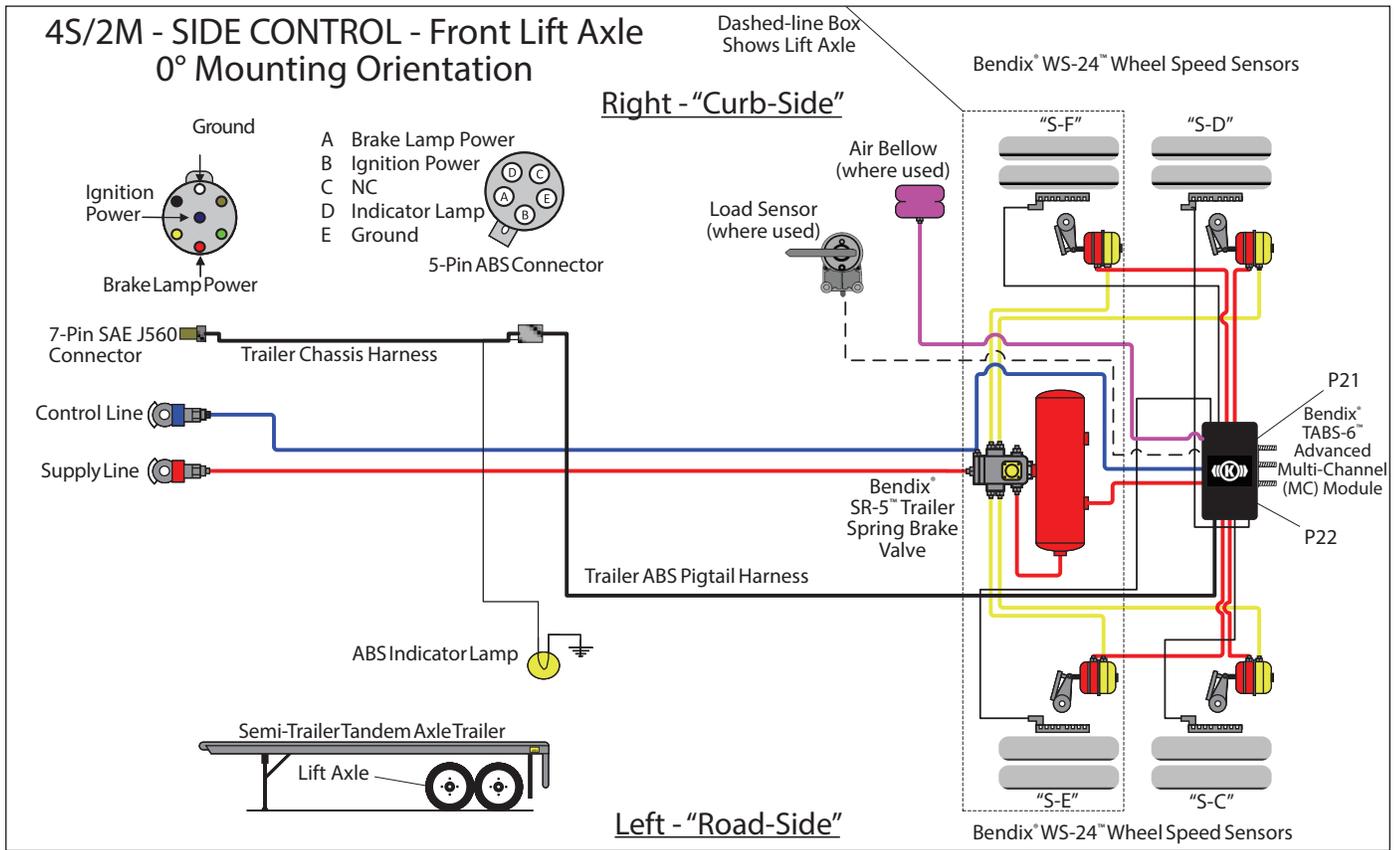


**Figure 26 – Bendix® TABS-6™ Advanced Multi-Channel (MC) Module - Typical 4S/2M Axle Control Antilock Braking System (ABS) Electrical and Air System**

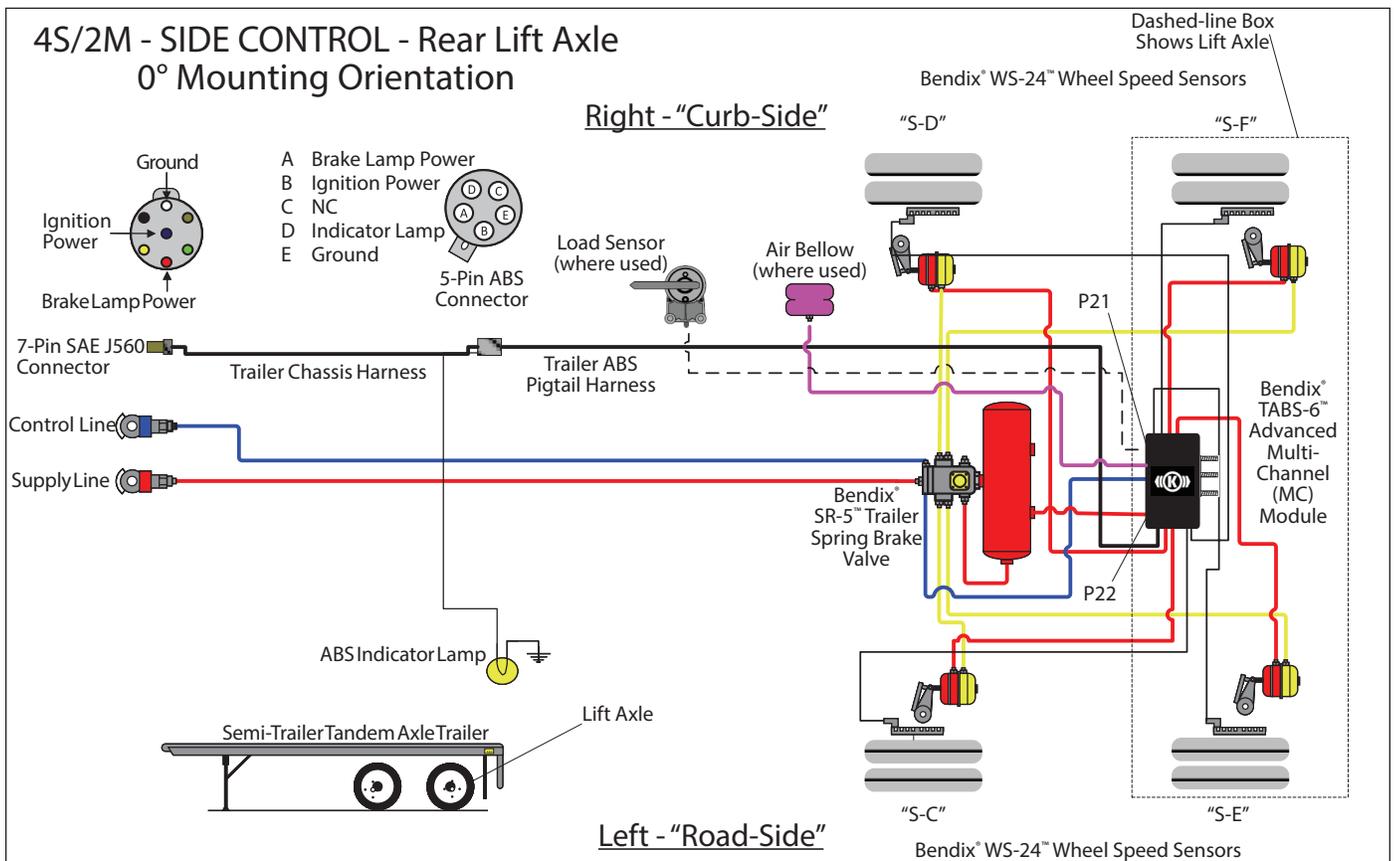


**Figure 27 – Bendix TABS-6 Advanced MC Module - 4S/2M Axle Control (180°) ABS Electrical and Air System**

# Troubleshooting: System Schematics

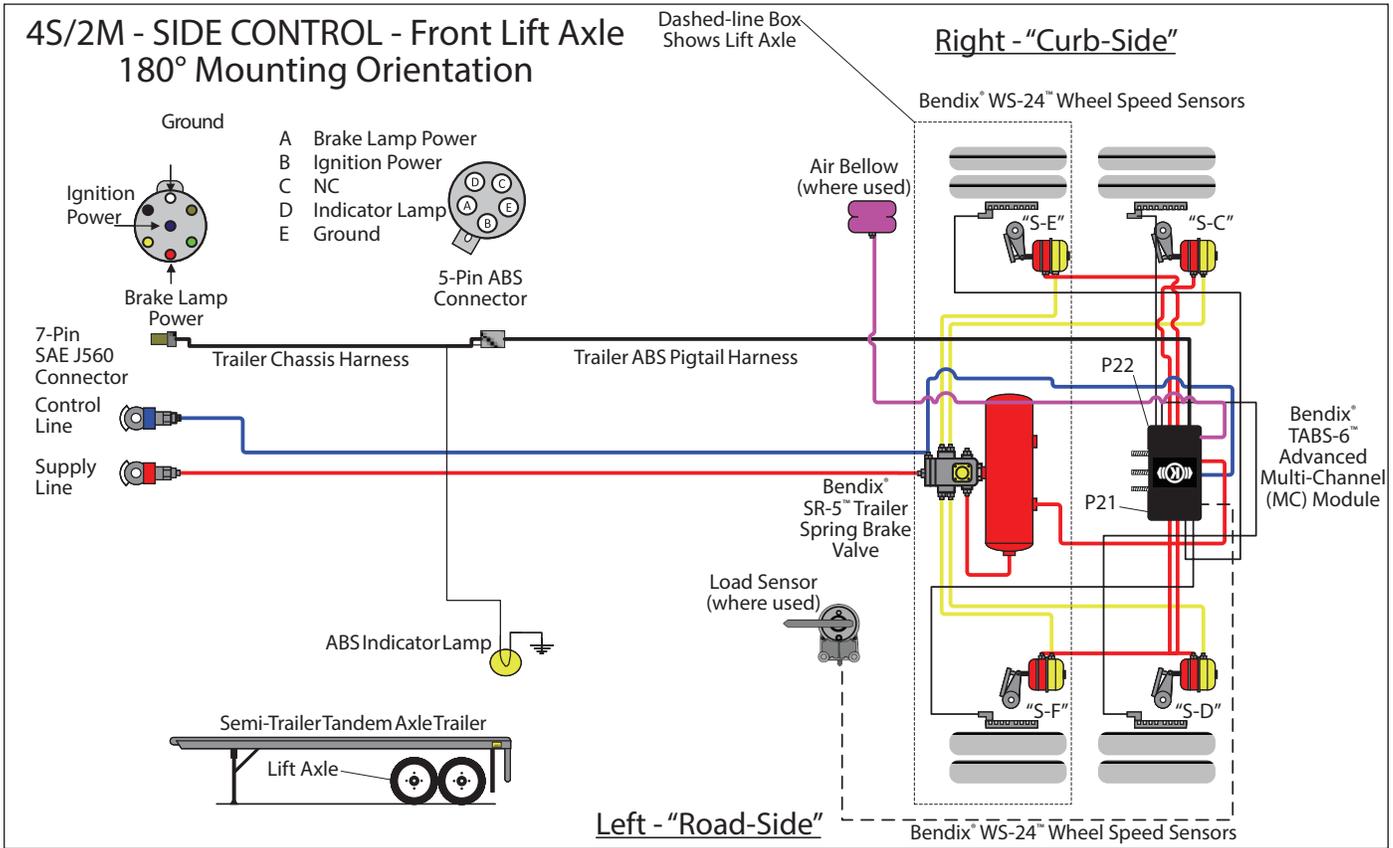


**Figure 28 – 4S/2M Side Control (0°) with Front Lift Axle, Antilock Braking System (ABS), Electrical, and Air System**

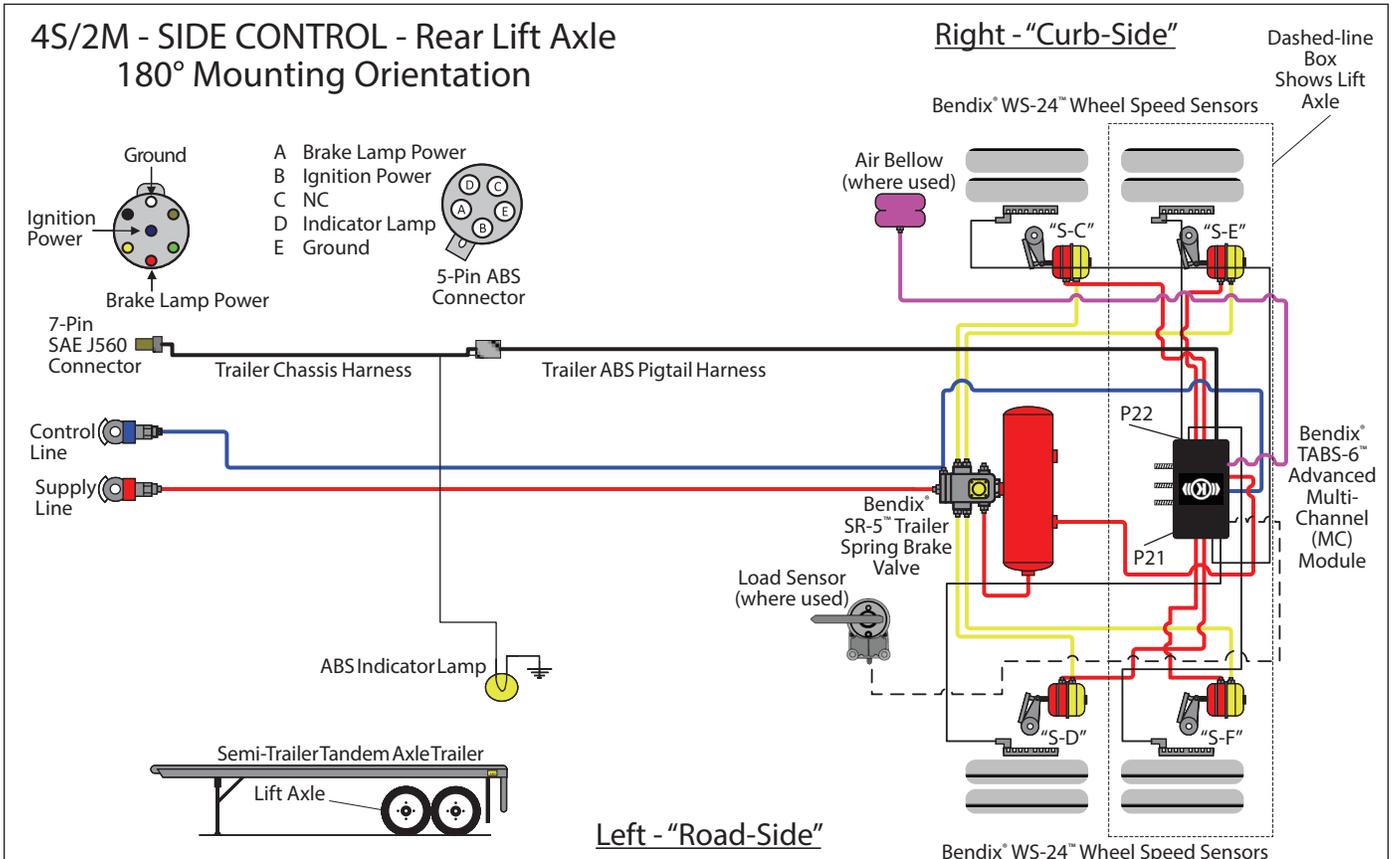


**Figure 29 – 4S/2M Side Control (0°) with Rear Lift Axle, ABS, Electrical, and Air System**

# Troubleshooting: System Schematics

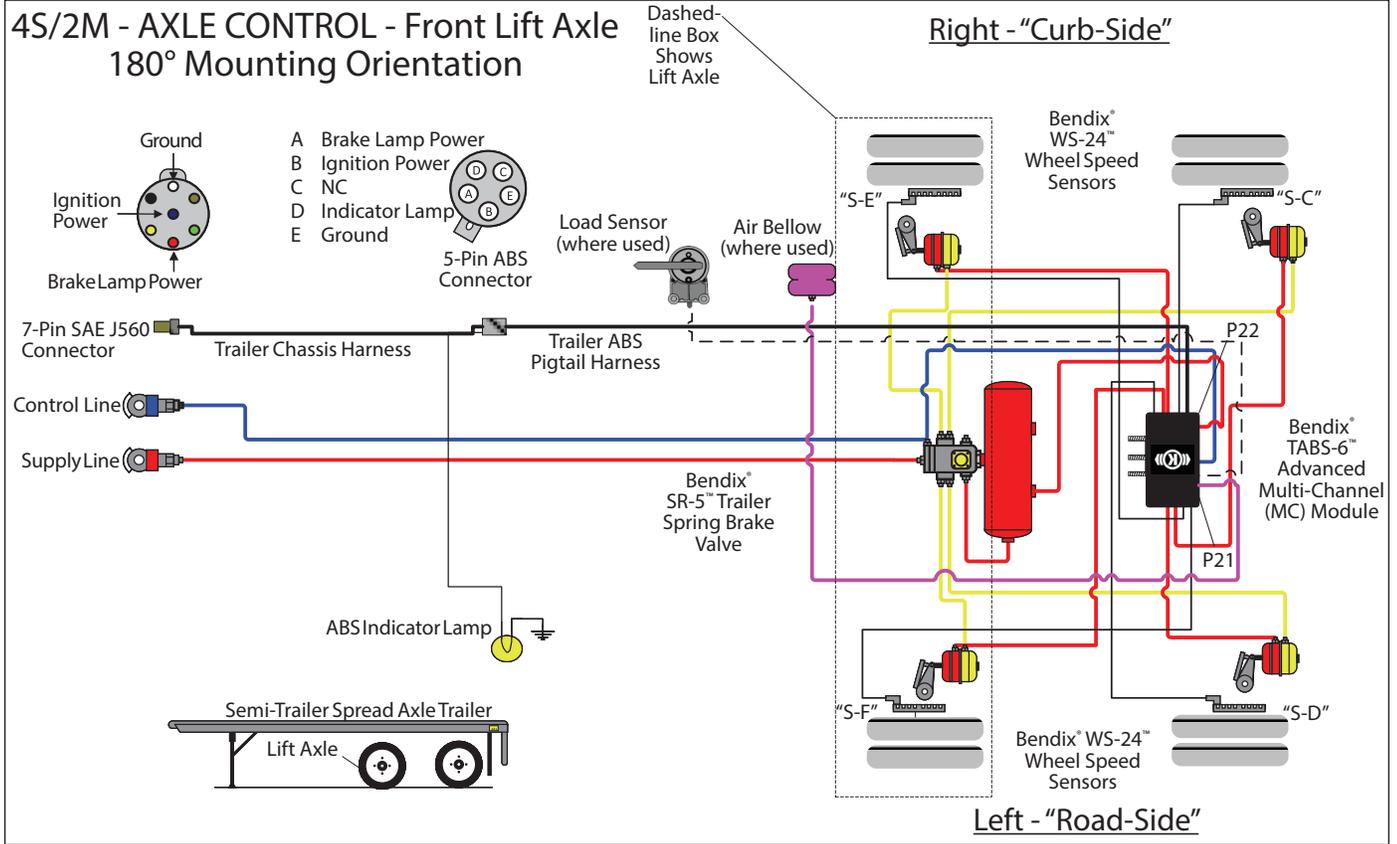


**Figure 30 – 4S/2M Side Control (180°) with Front Lift Axle, Antilock Braking System (ABS), Electrical, and Air System**

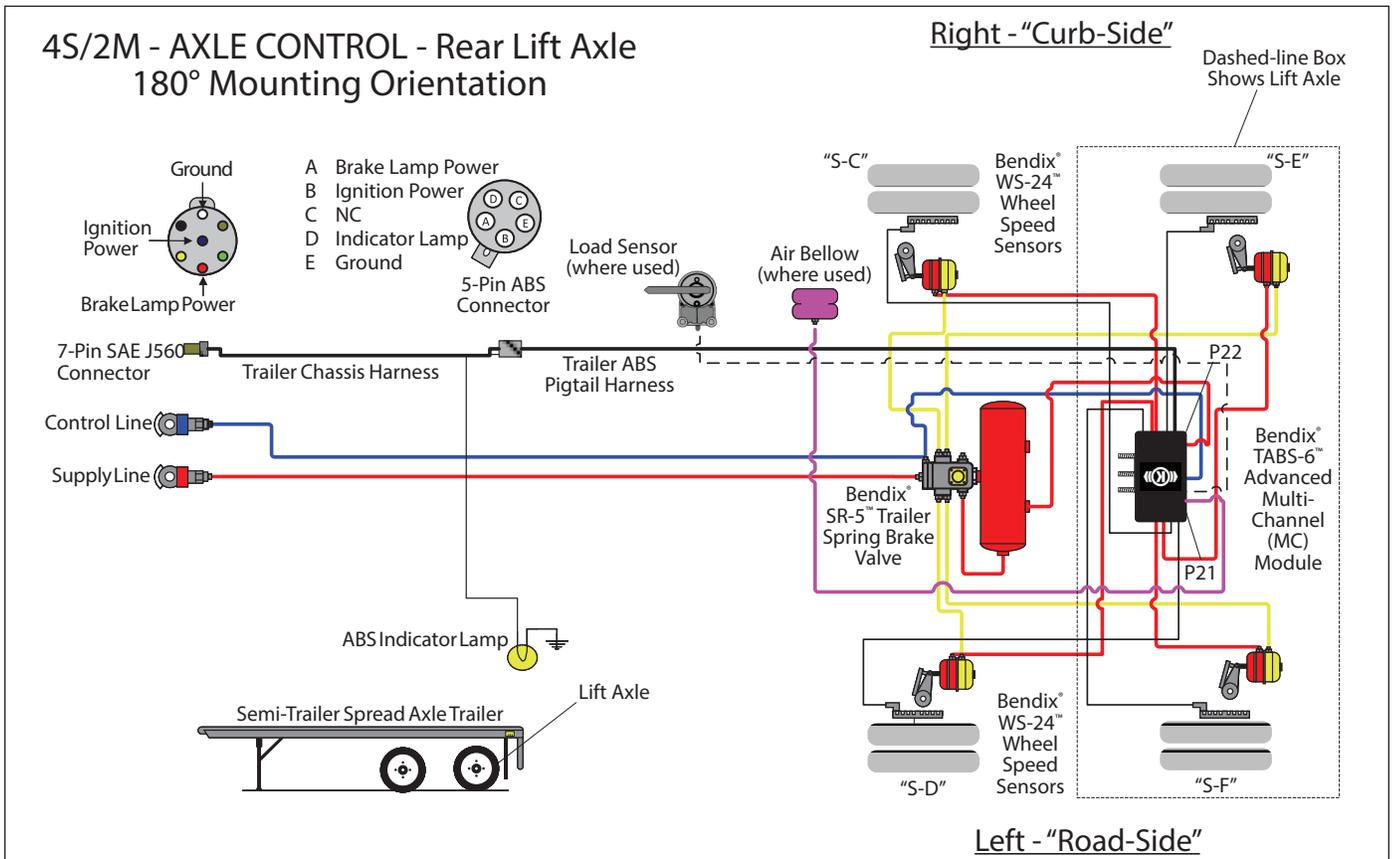


**Figure 31 – 4S/2M Side Control (180°) with Rear Lift Axle, ABS, Electrical, and Air System**

# Troubleshooting: System Schematics

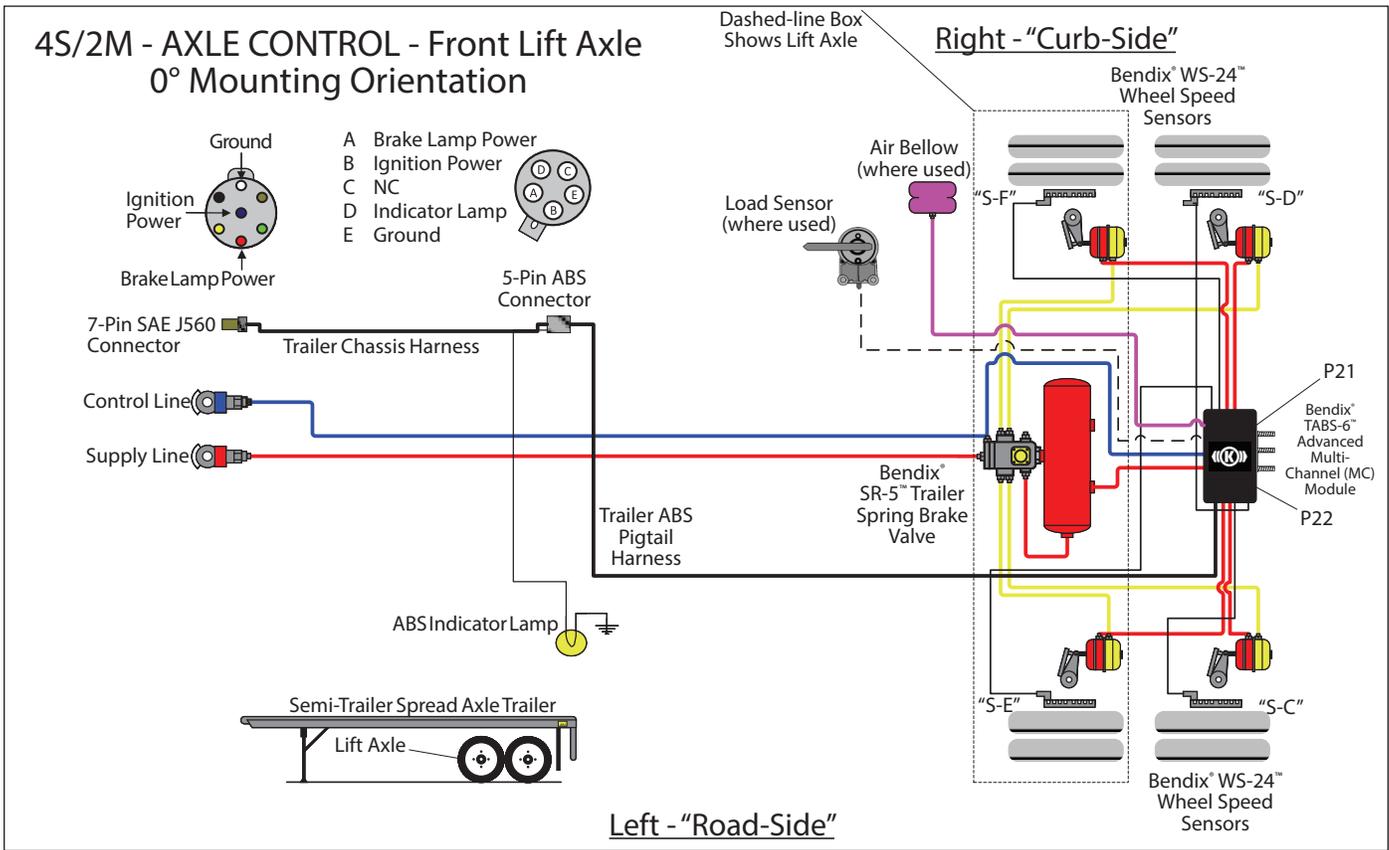


**Figure 32 – 4S/2M Axle Control (180°) with Front Lift Axle, Antilock Braking System (ABS), Electrical, and Air System**

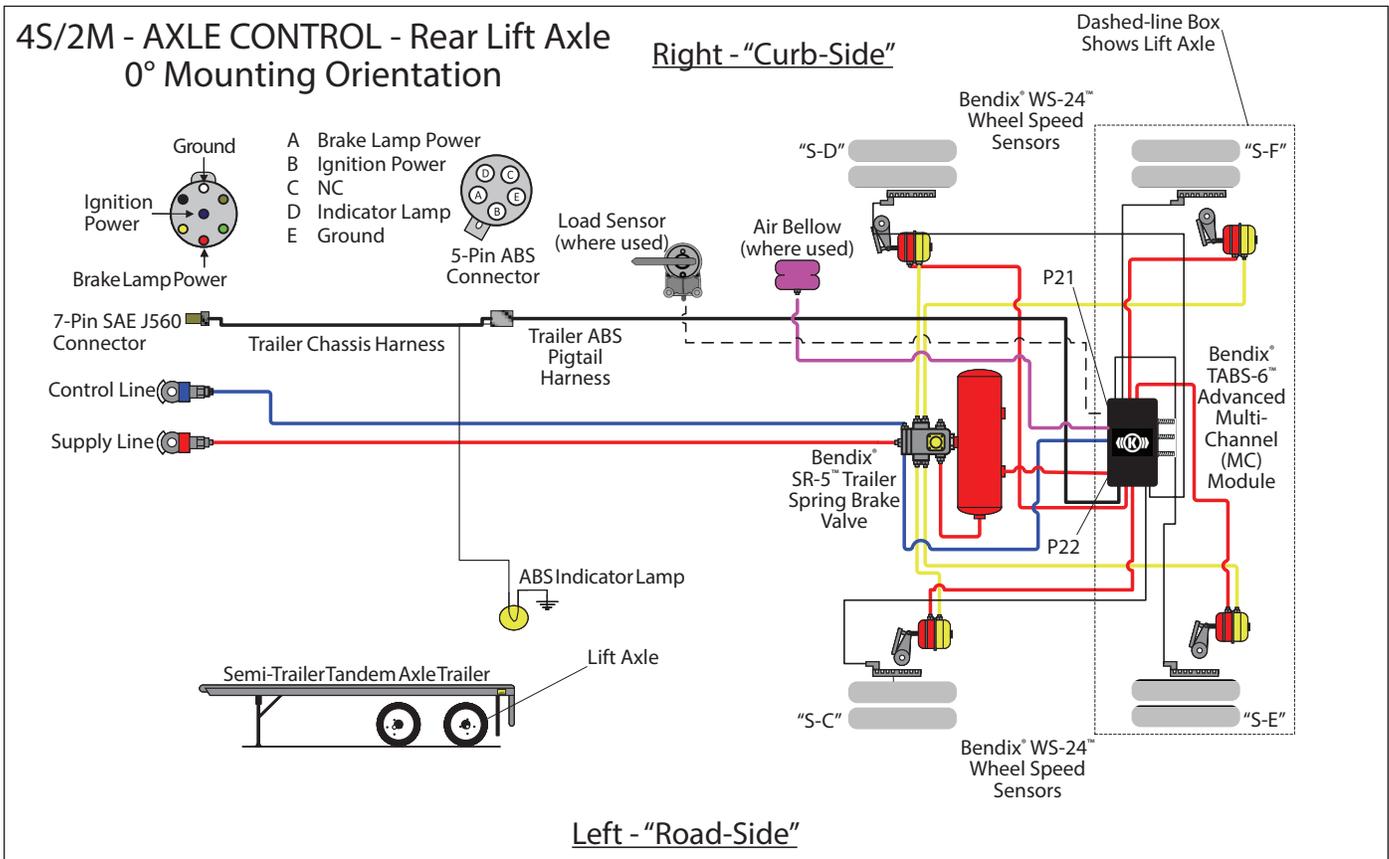


**Figure 33 – 4S/2M Axle Control (180°) with Rear Lift Axle, ABS, Electrical, and Air System**

# Troubleshooting: System Schematics



**Figure 34 – Bendix® TABS-6™ Advanced Multi-Channel (MC) Module - Typical 4S/2M System with Front Lift Axle**



**Figure 35 – Bendix TABS-6 Advanced MC Module - 4S/2M Axle Control System with Rear Lift Axle**

# Troubleshooting: Flowcharts

Diagnostic Trouble Code (DTC) information can be retrieved from the Bendix® TABS-6™ Advanced Multi-Channel (MC) module by using blink code diagnostics or a diagnostic tool. The following troubleshooting flowcharts will help the technician isolate the cause and confirm whether the problem resides in the component, wiring, or connectors.

Troubleshooting should always begin by observing the dash- or trailer-mounted Antilock Braking System (ABS) indicator lamp during the TABS-6 Advanced MC module's power-up sequence. If it is necessary to take electrical

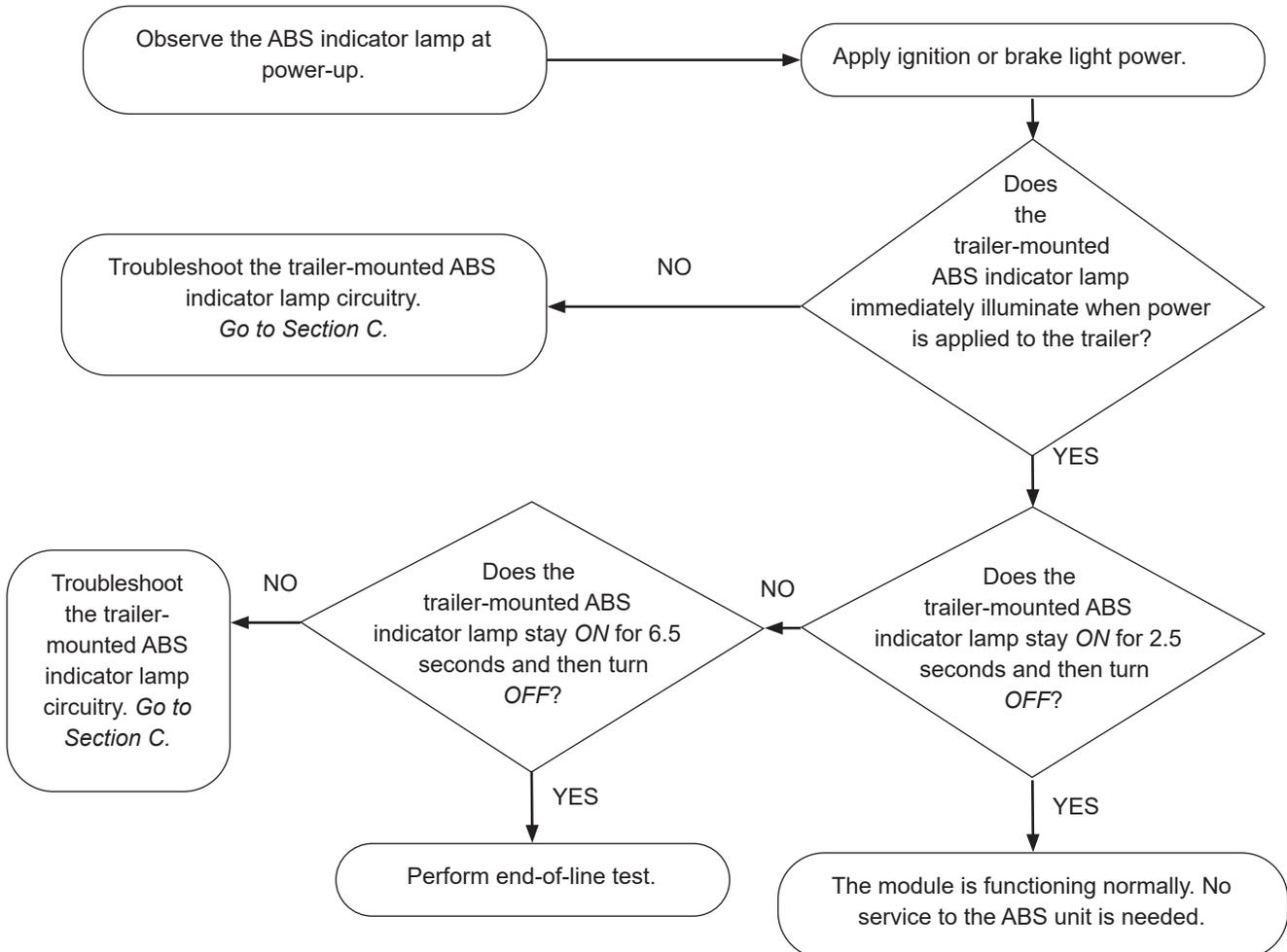
measurements, always begin by taking voltage and resistance measurements at the 7-pin or 12-pin Electrical Control Unit (ECU) pigtail harness connector.

Once the source of the problem is found, isolate the area needing repair by repeating the measurements at all connections in the affected circuit towards the modulator, Wheel Speed Sensor (WSS), etc.

No voltage or resistance measurements are to be made on the ECU electrical header connector pins of the module.

Section A: (Power-Up Sequence) **Trailer-Mounted ABS Indicator Lamp** . . . . . **Page 43**  
 Section B: (Power-Up Sequence) **Dash-Mounted ABS Indicator Lamp** . . . . . **Page 44**  
 Section C: **Troubleshooting the Trailer-Mounted ABS Indicator Lamp Circuitry** . . . . . **Page 45**  
 Section D: **Troubleshooting the Power Supply**. . . . . **Page 46**  
 Section E: **Troubleshooting the Bendix® WS-24™ Wheel Speed Sensors** . . . . . **Page 47**  
 Section F: **Troubleshooting the Load Sensor (Out-of-Range Condition)**. . . . . **Page 49**  
 Section G: **Troubleshooting an Automatic Lift Axle that Remains Lowered** . . . . . **Page 50**  
 Section H: **Troubleshooting an Automatic Lift Axle that Remains Raised**. . . . . **Page 55**

## SECTION A: POWER-UP SEQUENCE - TRAILER-MOUNTED ABS INDICATOR LAMP



## SECTION B: (POWER-UP SEQUENCE) DASH-MOUNTED ANTILOCK BRAKING SYSTEM (ABS) INDICATOR LAMP

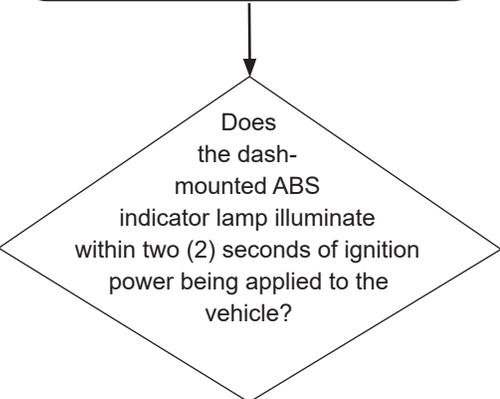
Verify that a PLC trailer is connected to the tractor via the 7-pin connector. Turn the ignition *ON* and observe the dash-mounted trailer ABS indicator lamp.

The trailer ABS indicator lamp does not illuminate.

**NOTE:** Only towing vehicles built after March 1, 2001 are required to have a trailer ABS indicator lamp. The trailer ABS indicator lamp, located on the vehicle dash, is only activated by a PLC signal from a trailer or diagnostic tool. The towing trailer must be equipped with an ABS unit with PLC.

Verify that a PLC signal is present on the trailer ignition power lines. (*Refer to the PLC Communications section of this document.*)

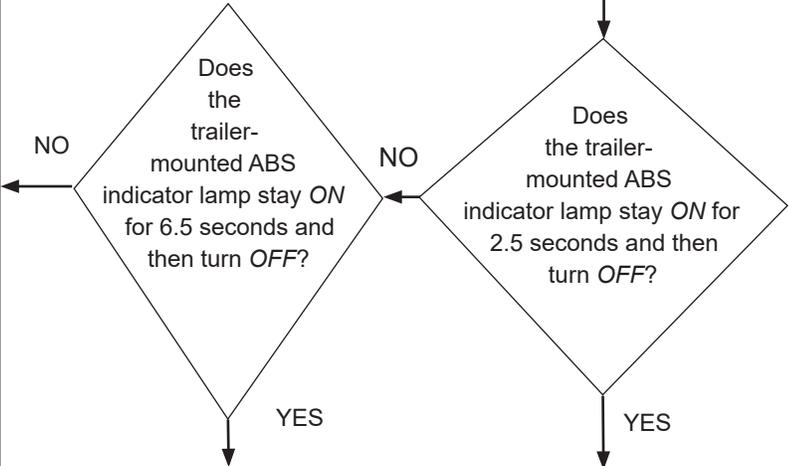
If a PLC signal is present and the trailer ABS lamp does not illuminate at ignition, troubleshoot the dash-mounted trailer lamp circuit on the tractor.



The dash-mounted trailer ABS indicator lamp stays *ON*. This is an indication that the trailer ABS unit has a Diagnostic Trouble Code (DTC).

If the dash-mounted trailer ABS indicator lamp remains *ON* with no trailer connected, troubleshoot the dash-mounted trailer lamp circuit on the tractor.

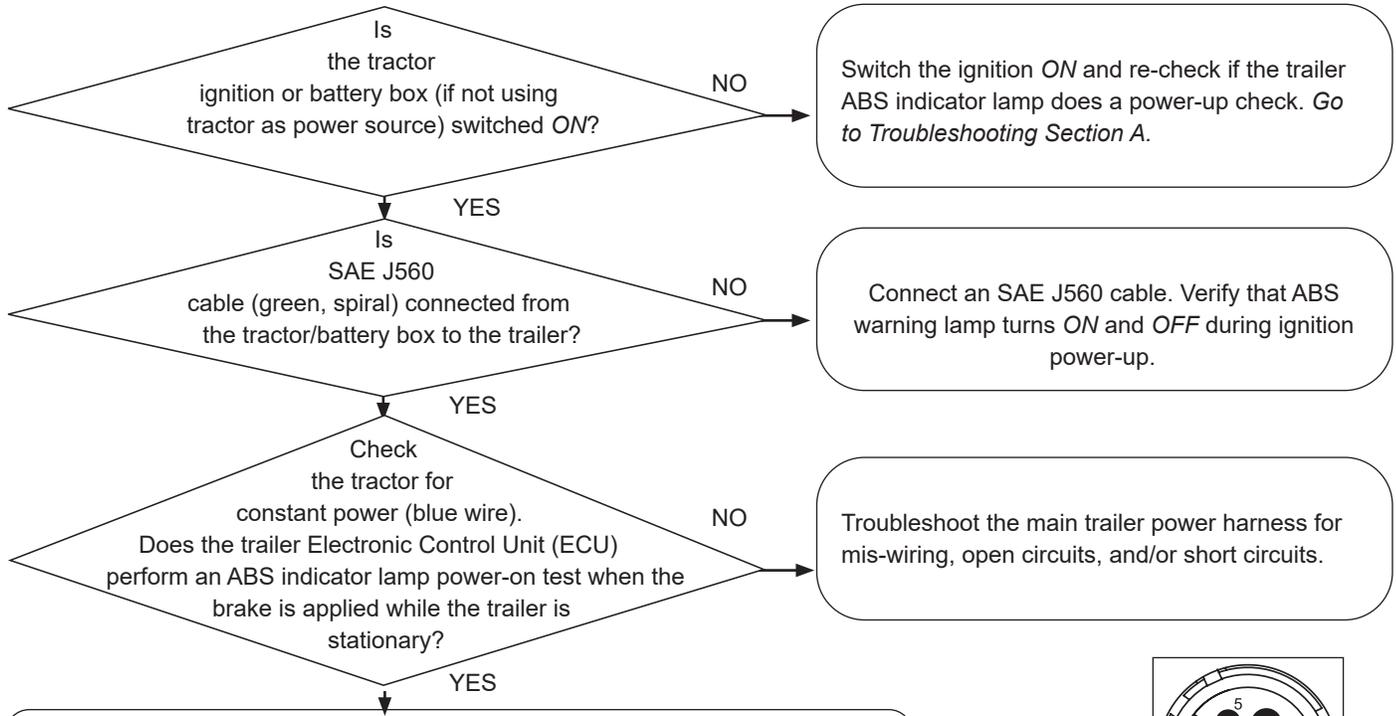
If the trailer ABS lamp remains *ON* with a trailer connected, rerun the power-up sequence for the trailer-mounted ABS indicator lamp. Go to *Section A*.



Perform end-of-line test.

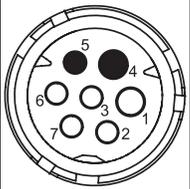
The module is functioning normally. No service to the ABS unit is needed.

## SECTION C: TROUBLESHOOTING THE TRAILER-MOUNTED ANTILOCK BRAKING SYSTEM (ABS) INDICATOR LAMP CIRCUITRY



Add constant power (blue wire) to the center pin of the SAE J560 connector..

Looking into the Bendix® TABS-6™ Advanced Multi-Channel (MC) Module 7-pin connector pigtail harness. Pin 4 is the ground pin. Pin 5 is the ABS indicator lamp pin.



**ACTION: If the trailer-mounted ABS indicator lamp did not illuminate during the power-up sequence...**

Troubleshoot the power supply to the ABS module. Go to Section D. Continue if the power and ground wiring are OK.

Turn the power to the module OFF. Inspect the condition of the ABS indicator lamp, connector, and ground. Using a volt/ohm meter, verify continuity from the trailer chassis ground pin (pin 4) to the ground pin of the indicator lamp.

If repairs are made, rerun the power-up sequence. Go to Section A.

Continue if the indicator lamp and ground wire check out OK.

With power to the ABS module OFF, disconnect the 7-pin ECU connector. Verify continuity from the ABS indicator lamp pin (pin 5) of the ECU connector to the ABS indicator lamp connector. If repairs are made, rerun the power-up sequence. Go to Section A. If the condition persists, contact the Bendix Tech Team.

**ACTION: If the trailer-mounted ABS indicator lamp remains ON after the standard power-up time interval of approximately 2.5 seconds...**

Determine if a module Diagnostic Trouble Code (DTC) exists using any of the following methods:

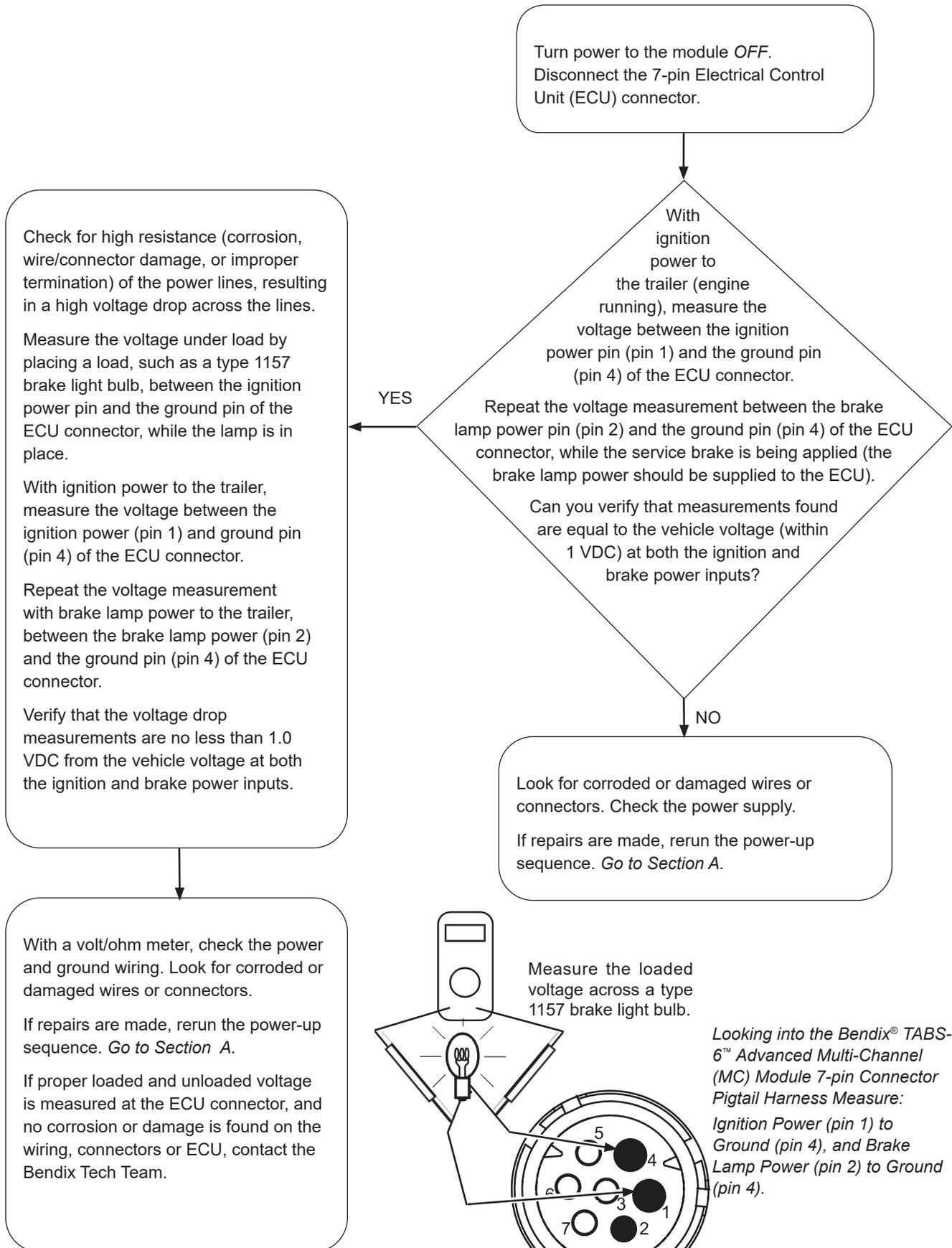
- Blink code diagnostics, Section 20
- PC diagnostics, Section 23
- Trailer Remote Diagnostic Unit, Section 23
- Bendix® Trailer Information Module, Section 23

If DTC(s) exist, and repairs are made, rerun the power-up sequence. Go to Section A. If no DTCs are found, the ABS module appears to be functioning normally, but the ABS lamp remains on, continue to the next step.

With power to the ABS module OFF, disconnect the 7-pin ECU connector.

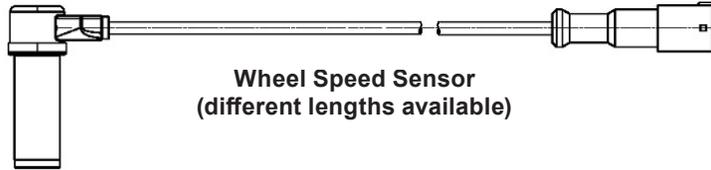
Apply power to the trailer. If the ABS lamp illuminates, there is a voltage short on the lamp circuit. Troubleshoot, repair, and retest. Use a volt meter to check if there is a short to the voltage on the warning lamp circuit between the ABS indicator lamp pin (pin 5) and the lamp. If repairs are made, rerun the power-up sequence. Go to Section A. If the condition persists, replace the ABS module.

## SECTION D: TROUBLESHOOTING THE POWER SUPPLY

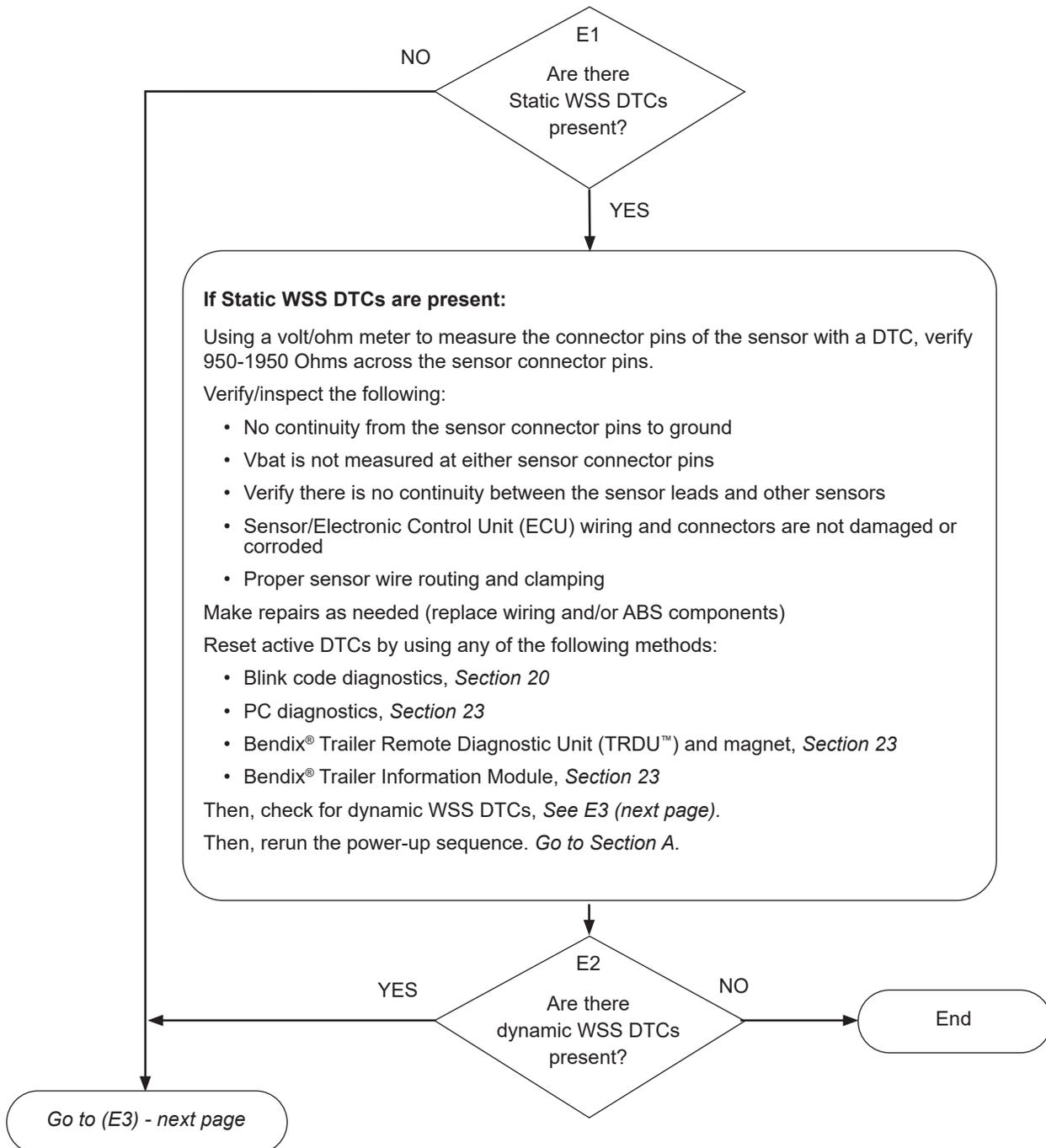


## SECTION E: TROUBLESHOOTING THE BENDIX® WS-24™ WHEEL SPEED SENSORS (WSS)

Turn the power to the module *OFF* and disconnect the wheel speed sensor connector. **NOTE:** For some troubleshooting steps, both static and dynamic WSS Diagnostic Trouble Codes (DTCs) may be present:



For additional troubleshooting steps, see *Service Data Sheet SD-13-4860, Bendix® WS-24™ Antilock Wheel Speed Sensor.*



## SECTION E: TROUBLESHOOTING THE BENDIX® WS-24™ WHEEL SPEED SENSORS (WSS) [CONTINUED]

E3: Dynamic WSS Diagnostic Trouble Codes (DTCs) are present

**NOTE:** If dynamic WSS DTCs are related to a lift axle problem, they will typically occur in pairs (“SE” and “SF”) or (“SC” and “SD”).

**E4**  
Is the trailer equipped with one (1) or more lift axle(s)?

NO

Continue to E7: Sensor and wheel inspection.

**E5**  
Are there WSS installed on the lift axle?

YES

NO

Go to E7: Sensor and Wheel Inspection.

**E6**  
Are sensors “SC” and “SD” installed on the lift axle?

YES

NO

Sensors “SE” and “SF” are on the lift axle, as needed. Use the Bendix® ACom® PRO™ diagnostic software to check if the trailer is configured for a lift axle. If the vehicle is not yet configured for a lift axle, use the ACom PRO diagnostic software to configure the trailer for a lift axle and configure an auxiliary input/output (I/O) for lift axle sensing using the steps in this document. When configuring a trailer for an automatic lift axle, the system will either require a pressure switch be placed in one of the lift air bags (as near as possible to – or actually in – the air bag), or an automatic lift axle solenoid will need to be installed and configured.

The vehicle setup needs to be rearranged so that sensors “SE” and “SF” are on the lift axle, and “SC” and “SD” are on the stationary axle. Using *Figures 28 through 35*, change the vehicle to ensure all of the sensors are in the correct locations for a lift axle, then rerun the power-up sequence.

**E7: Sensor and Wheel Inspection**

**E8: Repairs**

Rotate the affected wheel and verify a minimum of 0.25 VAC sensor output is seen across the WSS pins while rotating the wheel at least 0.5 rps. This voltage output will vary based on how fast the wheel is being rotated.

**NOTE:** A properly positioned sensor can output more than 2.0 VAC at 1 rps.

Verify/inspect the following:

- WSS properly contact the tone ring
- The condition and retention force of the sensor sleeve
- Proper sensor lead condition, routing, and clamping sleeve
- Condition of the tone ring mounting and teeth
- Proper number of tone ring teeth per sensed wheel
- Proper adjustment of wheel bearings
- Condition of the foundation brakes
- Check for corroded/damaged wiring or connectors between the ECU and the WSS

Then, rerun the power-up sequence. *Go to Section E8.*

Make repairs as needed (replace wiring and/or ABS components).

Reset active DTCs by using any of the following methods:

- Blink code diagnostics, *Section 20*
- PC diagnostics, *Section 23*
- Bendix® Trailer Remote Diagnostic Unit (TRDU™) and magnet, *Section 23*
- Bendix® Trailer Information Module, *Section 23*

**NOTE:** If you do not reset manually, these will typically reset automatically after a power cycle and the vehicle has been driven for a period of time.

Then, rerun the power-up sequence. *Go to Section A.*

## SECTION F: TROUBLESHOOTING THE LOAD SENSOR (OUT-OF-RANGE CONDITION)

(NOTE: The indicator lamp for this condition is illuminated only after the vehicle moves.)

Turn power to the module OFF.

### For spring suspension system trailers:

Verify/inspect the following:

1. Inspect the load sensor linkage.
  - Check that the linkage is attached to the axle clamp.
  - Inspect for damage to the linkage components, loose connectors, and improper installation.
  - Check that the load sensor lever rod is in a horizontal position with the trailer empty. Verify that it is a Bendix® sensor.
  - Verify that the sensor linkage has not flipped over so that it faces the opposite direction.
2. Switch the power to the module ON. Using the Bendix® ACom® PRO™ diagnostic software, open the *Bendix® Trailer Roll Stability Program (TRSP®) Sensor* screen and select *Start*. Find the load (in lbs.) that the sensor is registering, and verify the actual trailer load is consistent with the value found. *See the NOTE below.*
3. Where the value does not appear to be correct, perform the load sensor resistance check:
  - Unplug the 12-pin connector, or the 2.4 (X4 connector), from the module. *Refer to Table 3.*
  - With the load sensor lever in the horizontal position, verify that approximately 2.5K Ohms is measured between the sensor supply pin and the sensor input pin, and between sensor input pin and sensor ground. *Refer to Table 3.*
  - Using the ACom PRO diagnostic software, open the configuration screen. Select the *Load and Sensor Configuration* tab, and then view the *Load Sensing* panel. Verify that the current *Sensing Type* is shown as *External*. If not, change the selection to *External*. Perform the external spring deflection sensor calibration. *Refer to Instruction Sheet S-1588, Spring Deflection Sensor.*
  - Note the values shown on the screen for the current load and sensor voltage. Verify that the values shown on the screen for the empty and laden weight and voltage are correct. Where the value does not appear to be correct, enter the correct value(s) on the configuration screen.

**NOTE:** Use a scale to obtain the actual empty trailer weight. Where possible, obtain the load/deflection curve from the suspension/spring manufacturer for the specific suspension/spring combination to find the expected values for this vehicle. Then, rerun the power-up sequence. *Go to Section A.*

### For air suspension system trailers:

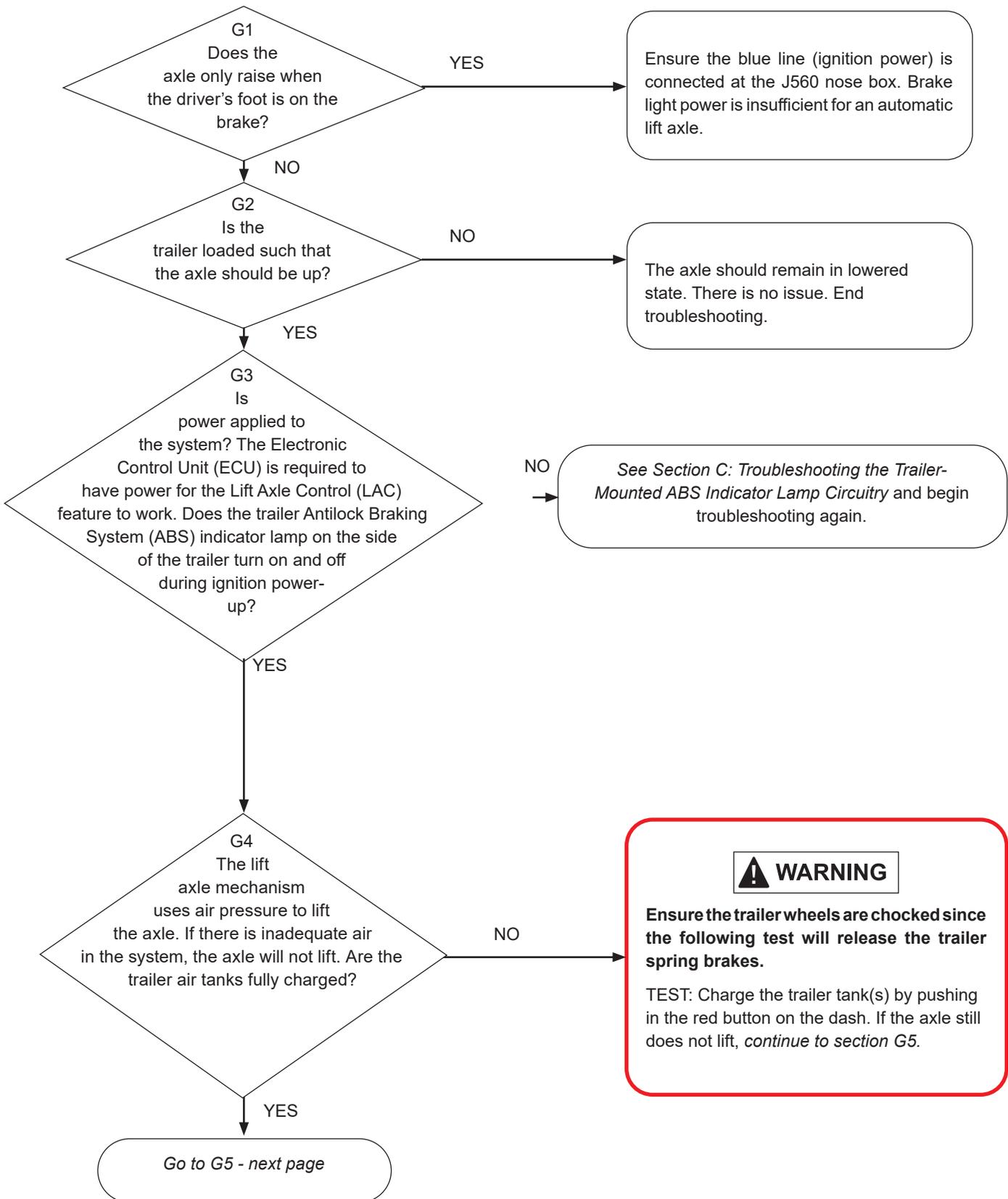
Verify/inspect the following:

1. Check that the load port P42 is connected to the primary suspension air bags **at a location as far from the height control valve as possible**. Verify that the air hose is not kinked.
2. Switch the power to the module ON. Using the ACom PRO diagnostic software, open the *Pressure* screen and select *Start*. Read the pressure shown for the load port (p42). If the pressure value is not as expected, close the *Pressure* window and open the *Controller Configuration* window. Then, select the *Load and Sensor Configuration* tab and view the *Load Sensing* panel. Verify that the current *Sensing Type* is shown as *Internal*. If not, change the selection to *Internal*.
3. Check that the suspension height control valve is functioning correctly.
4. Check for air leakage in the suspension system.
  - Using the ACom PRO diagnostic software, open the *TRSP Sensor* screen and select *Start*. Find the load (in lbs.) that the sensor is registering, and verify that the actual trailer load is consistent with the value found.
  - Note the values shown on the screen for the current load and pressure. Verify that the values shown on the screen for the empty and laden weight and pressures are correct. *See the NOTE below.*
  - Using the ACom PRO diagnostic software, where the value does not appear to be correct, select *Modify*, and enter the correct value(s) on the configuration screen.

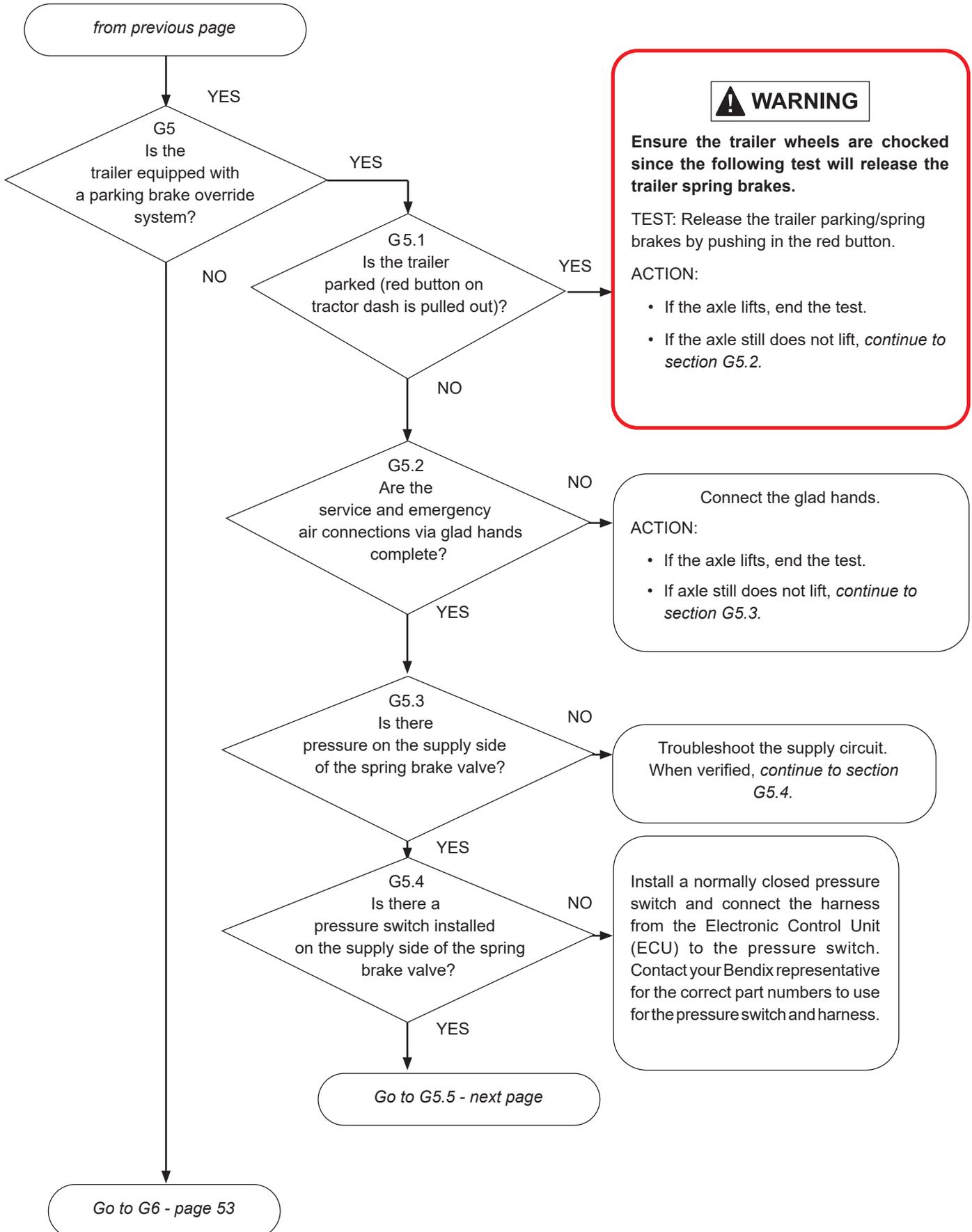
**NOTE:** Use a scale to obtain the actual empty trailer weight and use a pressure gauge to obtain actual empty trailer suspension air bag pressure. Where possible, obtain the load/pressure curve from the suspension manufacturer for the specific suspension/air bag combination to find the expected values for this vehicle.

Then, rerun the power-up sequence. *Go to Section A.*

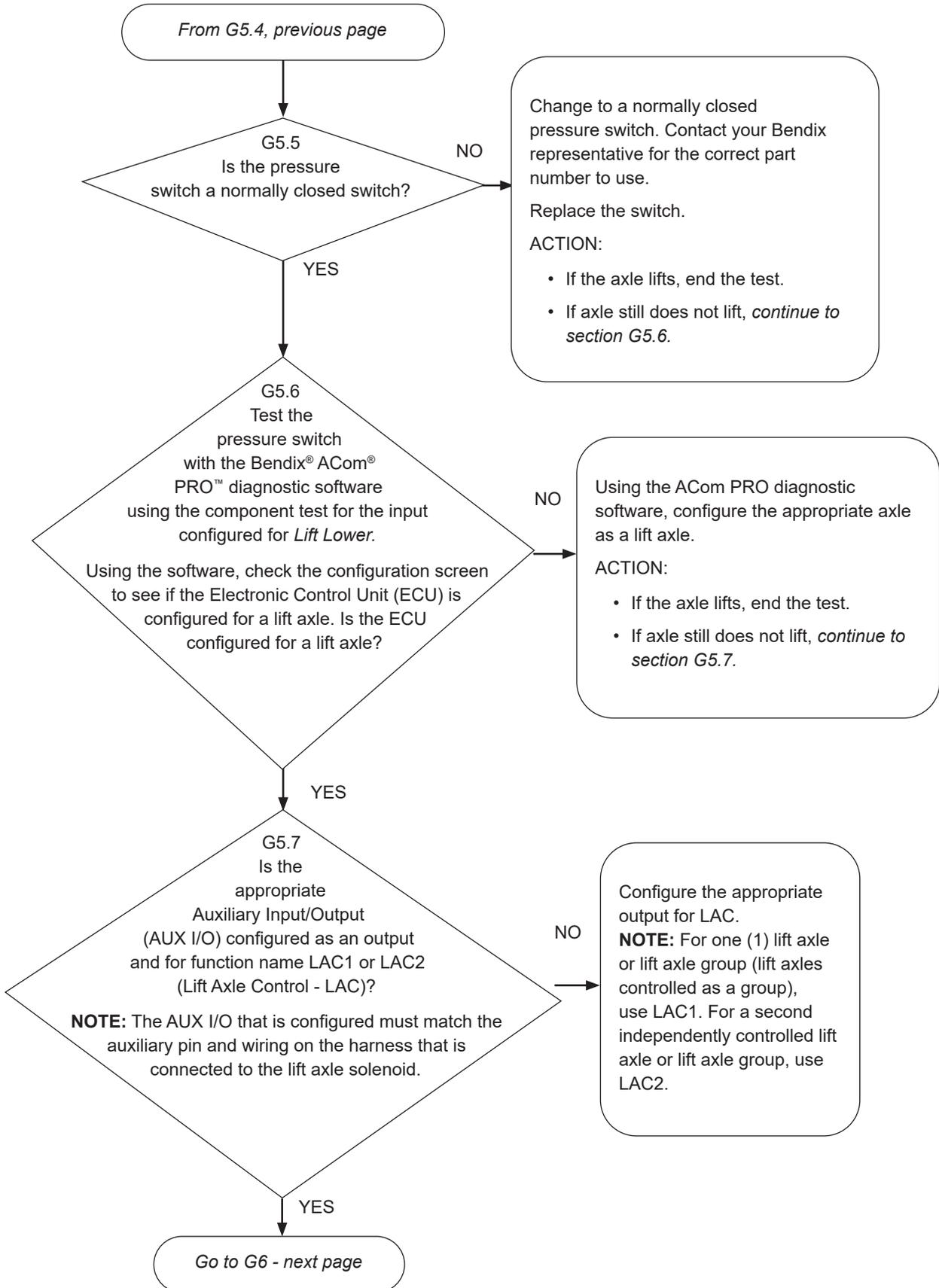
## SECTION G: TROUBLESHOOTING AN AUTOMATIC LIFT AXLE THAT REMAINS LOWERED



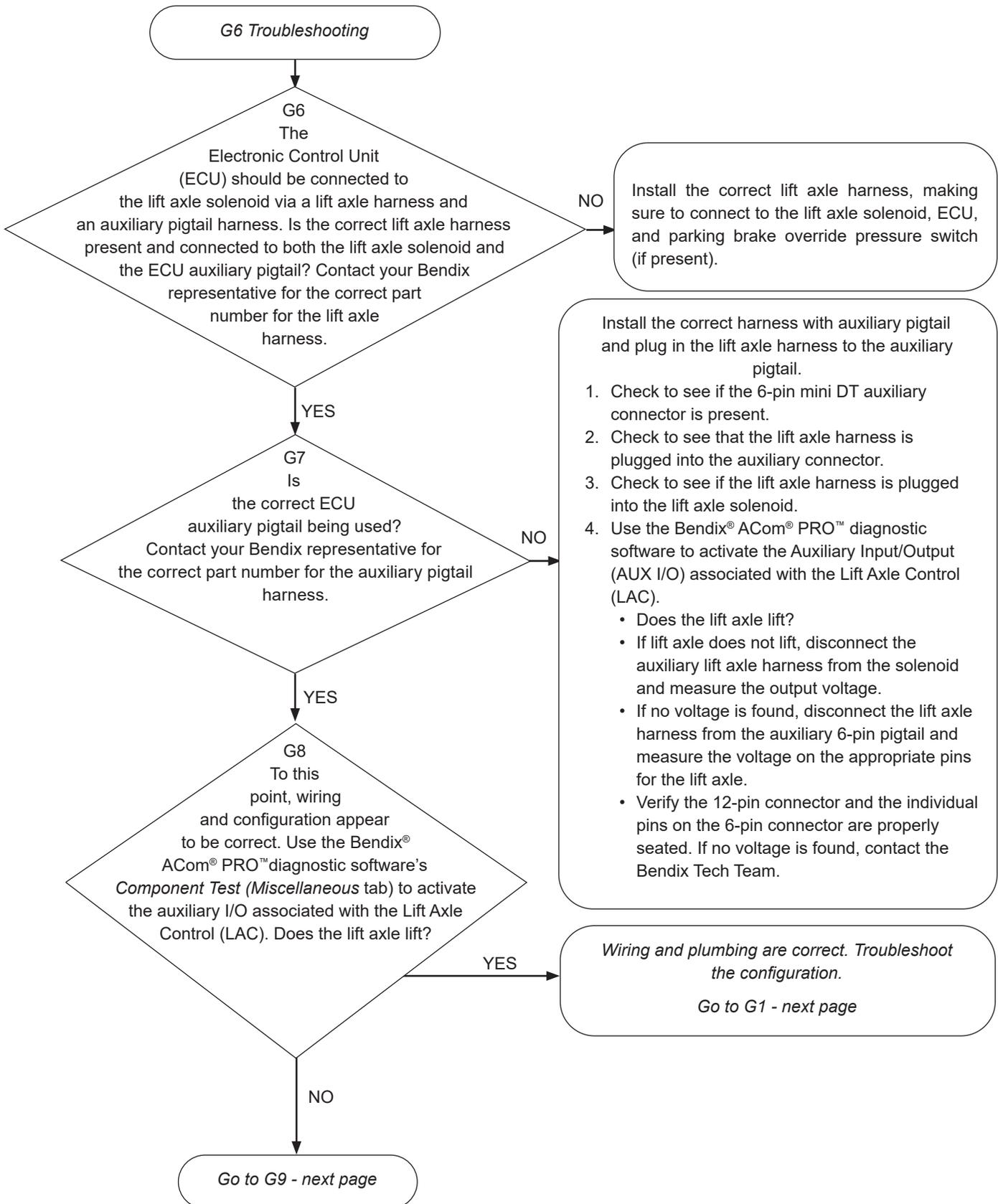
## SECTION G: TROUBLESHOOTING AN AUTOMATIC LIFT AXLE THAT REMAINS LOWERED (CONTINUED)



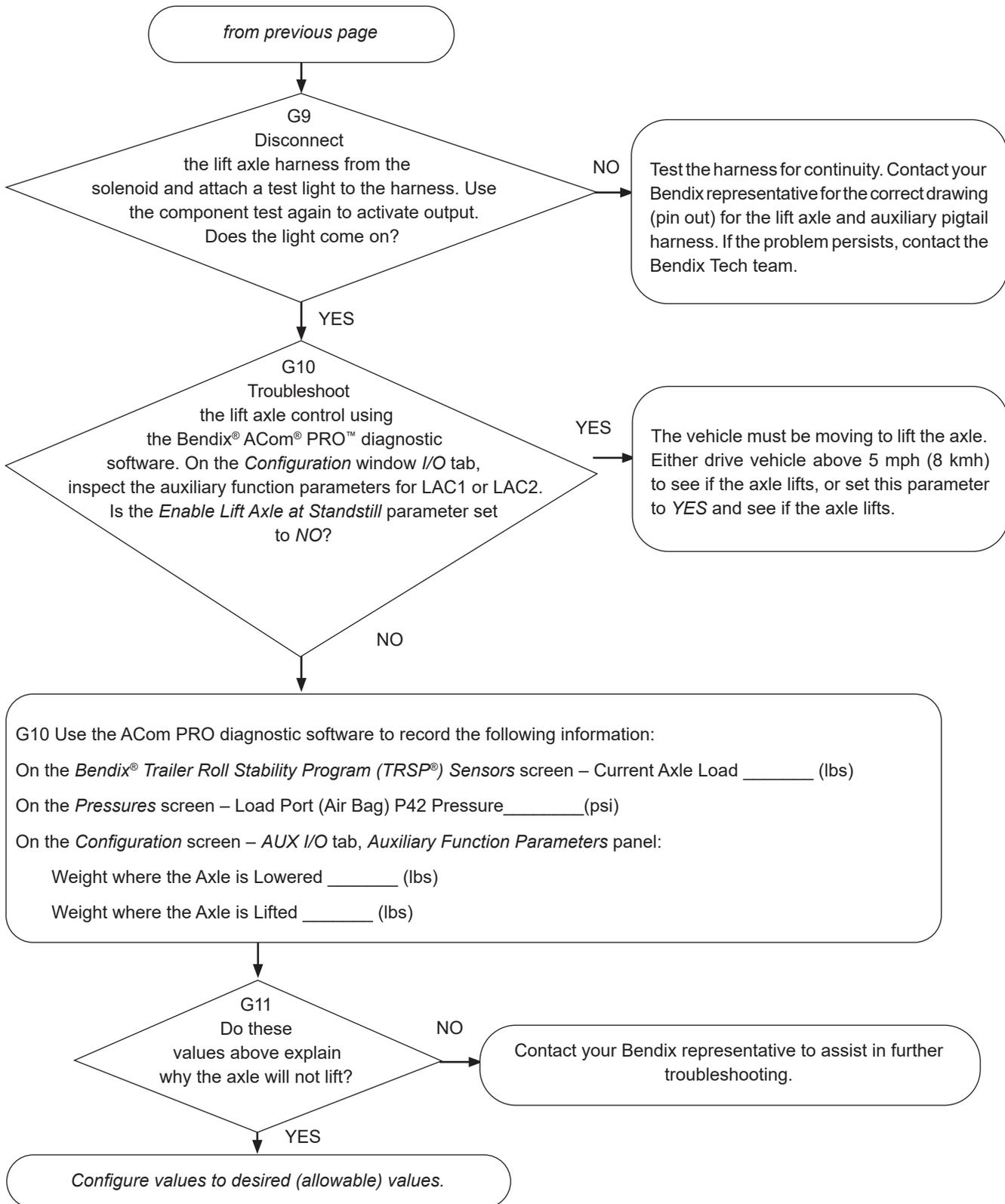
## SECTION G: TROUBLESHOOTING AN AUTOMATIC LIFT AXLE THAT REMAINS LOWERED (CONTINUED)



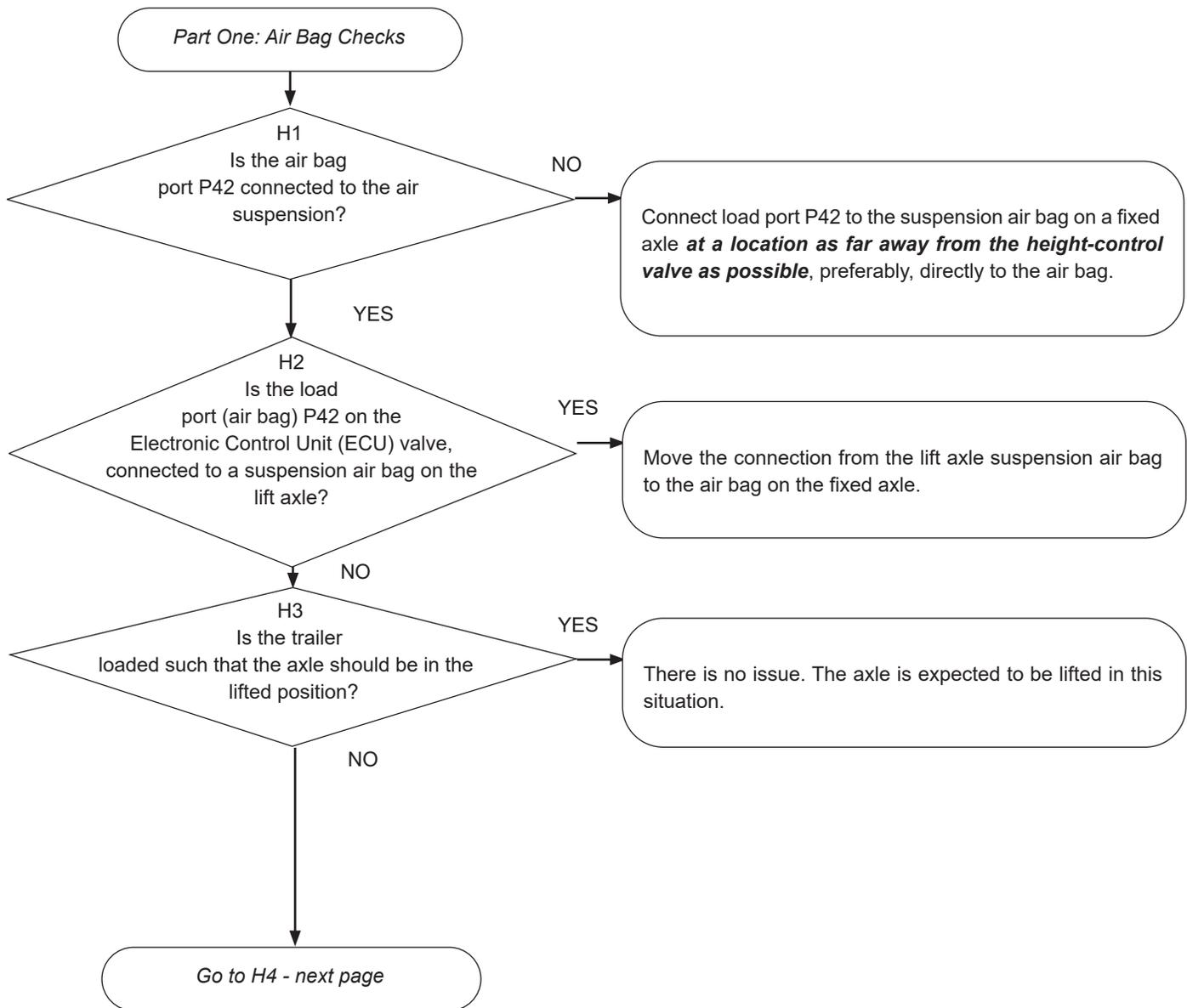
## SECTION G: TROUBLESHOOTING AN AUTOMATIC LIFT AXLE THAT REMAINS LOWERED (CONTINUED)



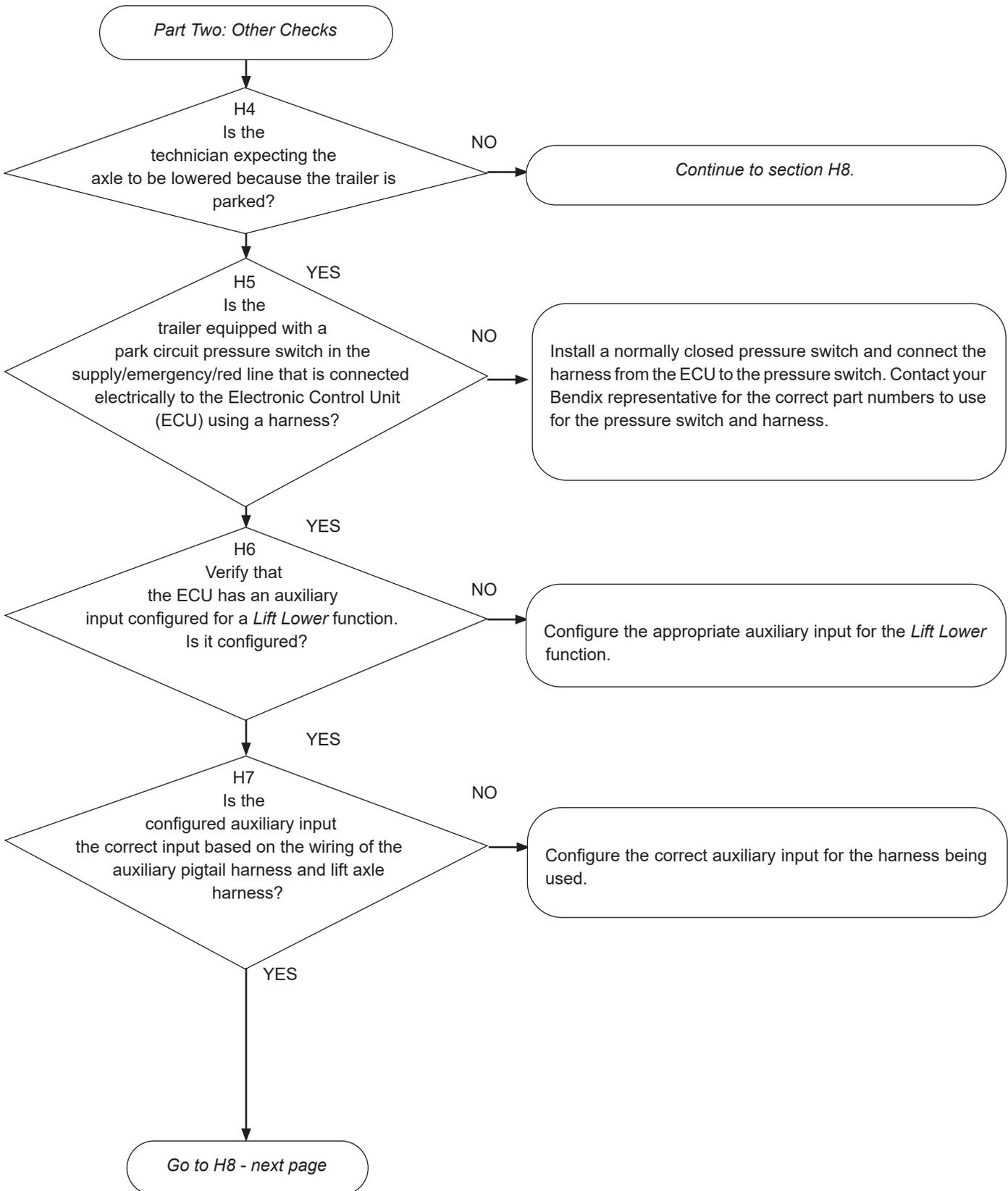
## SECTION G: TROUBLESHOOTING AN AUTOMATIC LIFT AXLE THAT REMAINS LOWERED (CONTINUED)



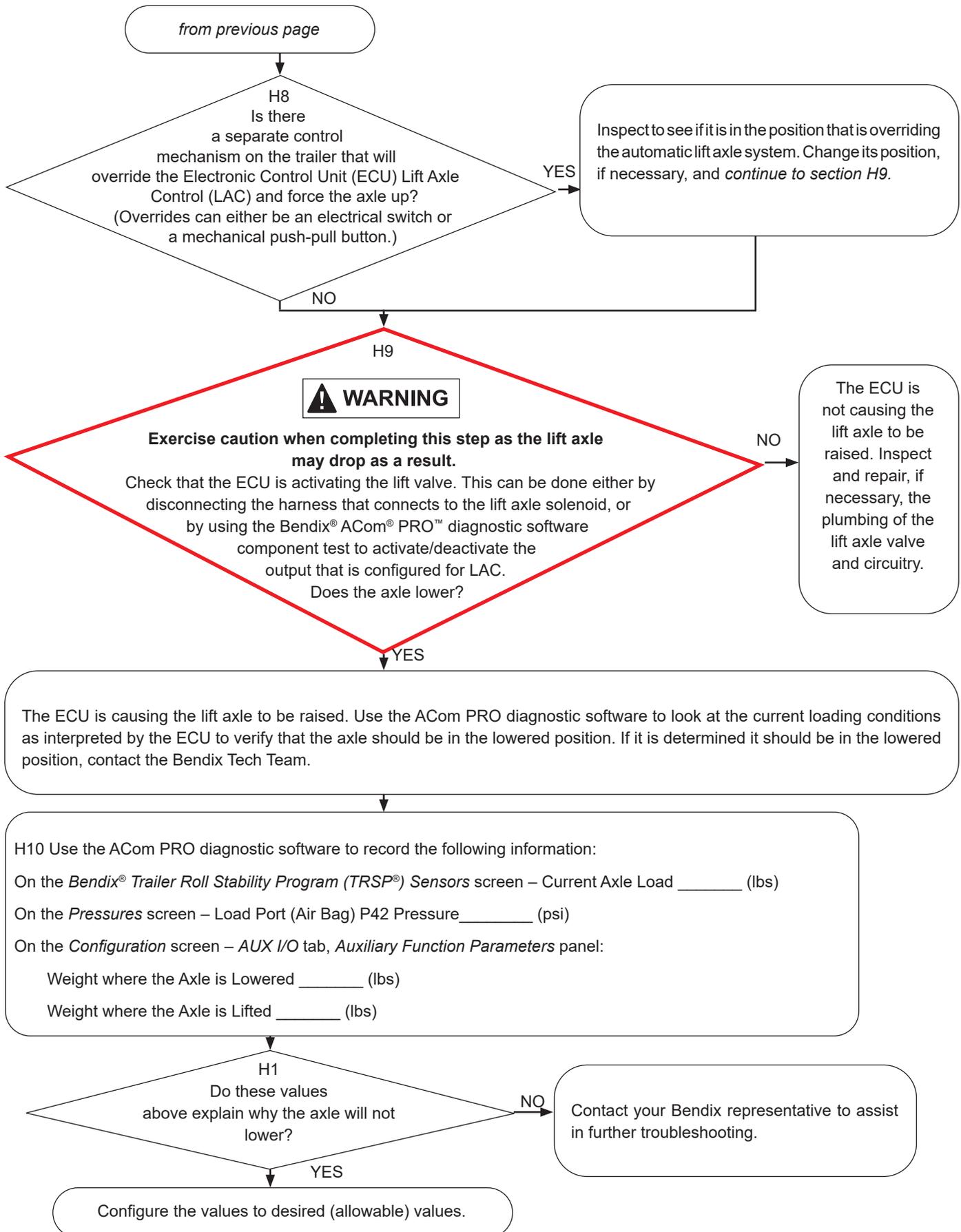
## SECTION H: TROUBLESHOOTING AN AUTOMATIC LIFT AXLE THAT REMAINS RAISED



## SECTION H: TROUBLESHOOTING AN AUTOMATIC LIFT AXLE THAT REMAINS RAISED (CONTINUED)



## SECTION H: TROUBLESHOOTING AN AUTOMATIC LIFT AXLE THAT REMAINS RAISED (CONTINUED)

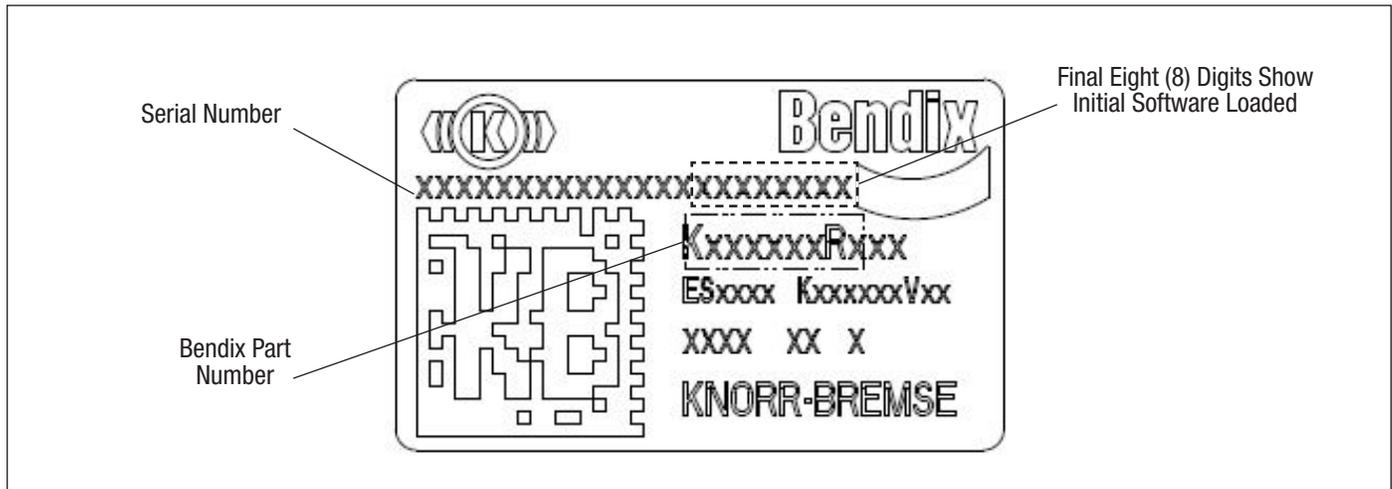


### Electronic Control Unit (ECU) Part Number Label

The external part number label is located above the control port of the module. If this label is not legible for any reason, the Bendix part number can be read from the ECU using a diagnostic tool.

### Software Revision Level

The number of the initial software loaded on the ECU is also indicated. The current software revision number can be read using a diagnostic tool.



**Figure 36 – Label information**

### Document Revision Level

For additional information on Bendix products and to ensure you have the latest version of the Service Data Sheet, please visit [bendix.com](http://bendix.com).

Document Description	Document Number
Bendix® TABS-6™ Standard and Premium Trailer ABS Module	SD-13-4767
Bendix® Single-Channel TABS-6™ Advanced Module	SD-13-47671
Bendix® WS-24™ AntiLock Wheel Speed Sensor	SD-13-4650
Bendix® TABS-8™ Advanced Single-Channel Trailer ABS Module	SD-13-47680
Spring Deflection (Load) Sensor Installation for Spring Suspensions	S-1588

**NOTES**

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